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AUTOMOTIVE INDUSTRIES
VOLUME 56 *Philadelphia, Saturday, June 25, 1927* NUMBER 25

Factories Watching *as* Dealers *Test* Used Car Plans

Manufacturers are studying results of such cooperative attacks on used car situation as have been evolved by dealers in Windsor and in Jacksonville.

By Lewis C. Dibble

THE rapid rise of cooperative movements among dealers for the betterment of the used car situation is one of the outstanding developments in the trade this year, and is causing considerable study and debate in the industry on whether or not car manufacturers should get together as a group and recommend certain definite plans to their dealers.

Manufacturers as a usual thing have stood together in recent years on important questions while dealers have been more or less at odds. In a number of cities, however, dealers are now working in unison, trying out new experiments in the used car merchandising field, while the automobile manufacturers are looking on anxiously to observe the net results. At any rate, the vigorous handling of the used car situation by dealers bids fair to relieve, in part at least, the responsibility of the manufacturers in this respect, which has been growing steadily more onerous.

The cooperative plans which have become more and more familiar to the industry in recent months are the Windsor Plan of merchandising used cars through price publicity in the newspapers and the Jacksonville scrapping plan, both of which were described some weeks ago in *Automotive Industries*. The Windsor plan made its appearance first and was followed by the Jacksonville scrapping plan, which also is apparently making rapid headway.

The Jacksonville scrapping plan originated in Jacksonville, Fla., and, with some modifications, has been adopted in Omaha, Kansas City and Milwaukee, with St. Louis, Cincinnati and Louisville getting under way.

The Jacksonville plan calls for the organization of a cooperative corporation to take in cars from dealers who are members of the organization, for actual junking with or without the salvaging of parts, as the case may dictate.

Need for such a plan was strikingly brought out in the Omaha survey, which showed that 40 per cent of the cars taken in by junkmen were not actually junked but were resold and came back to the dealers as trade-ins. Many of these cars had been sold by the dealers to the junkmen at a nominal price.

The rise of this cooperative plan came most opportunely at a time when many manufacturers were considering whether they should have to follow the lead of a well-known producer in providing factory encouragement of scrapping. Both dealers and manufacturers have felt the need of removing unmerchantable old used cars from the roads, but effective and economical means were lacking. Dealers were saying that under the conditions existing they were not anxious to see any increase in production volume, as such increases added intolerably to their used car burdens. If manufacturers, they said, wanted more volume they ought to provide the means for removing the cars fit only for junking and not for sale.

Then came the Jacksonville and Omaha plans. The preliminary working of these plans has indicated that their cost should be nominal at most, and that there probably is a profit for the dealers in working them.

The Windsor Plan takes its name from Windsor, Ontario, just across the river from Detroit, where it was first adopted by the Border Cities Dealers' Association two years ago. The plan is still working in Windsor and has been adopted in practically all of the principal cities of Canada, including Sherbrook, Ottawa, Chatham, Windsor, Winnipeg, Saskatoon, Regina, Vancouver and Victoria, Toronto, Montreal, Edmunton, Lethridge, St. John, Brantford, Hamilton and London.

Briefly, the Windsor Plan consists of inserting advertisements at regular intervals in local newspapers under the caption "Used Car Buyers' Guide," wherein are quoted the used car prices of various makes of automobiles. The prices cover all models manufactured over a period of six or seven years and are tabulated by years and definitely identified by serial numbers which are also published. The idea of the plan is to stabilize more or less the price of used cars by giving the general public an idea of what used machines are actually worth, just the same as stock, grain or bond prices are quoted. This, it is claimed, works a two-fold benefit, both from the standpoint of educating the prospective used car purchaser as to values and giving the person who has a used car to trade an approximate idea of what his vehicle is worth.

The plan has no rules or regulations of any kind. The aim is to make it automtaic. This is accomplished by the dealers raising a substantial fund for an advertising

What Factory Executives Have

IN a survey recently conducted by Automotive Industries among manufacturers, a diversity of opinion on the Windsor Plan was found, much of which is set forth in summarized form in the accompanying article. One thing stood out in making this study, and it is to be regretted; that is that most manufacturers who oppose the Windsor Plan specify that they be not put on record at this time, while those who are for the plan, or are at least in a neutral position and still are studying it, are willing to be quoted. Following are statements on the subject from a number of automotive executives:

J. S. GARDNER, ASSISTANT GENERAL SALES MANAGER, GARDNER MOTOR CO.: After considering its advantages and possibilities I would say that our attitude is favorable to the Windsor Plan, as it would naturally be to any scheme that successfully controls used car prices and provides a quicker turnover. In general we would encourage our dealers to enter the plan, but the community surrounding each dealer calls for specific recommendations as the cases come up and there would be no object in our fostering the idea of a Gardner dealer going in on it if it was obvious at the start that the other dealers in the community are not for it. Instead of it being a problem for the manufacturers to enter into as a group or individually to recommend the adoption of the plan, it seems to us that it should rather be put up to the dealer bodies by the National Automobile Dealers Association and other such organizations.

M. L. BUCK, USED CAR MANAGER, OAKLAND MOTOR CAR CO.: In my opinion the Windsor Plan is the most constructive idea that has ever been introduced in the used car field, because it gives a certain guide for all concerned to go by. We are recommending it to Oakland and Pontiac dealers.

L. G. PEED, SALES MANAGER, WILLYS-OVERLAND, INC.: Personally I am in favor of the Windsor Plan on the ground that it cannot make conditions any worse, and may contribute to making them better. Wherever the Windsor Plan is recommended to the dealer organization, we encourage our dealers to participate. It would be a fine thing if the automobile manufacturers could get together as a group and indorse the plan, but it probably would be impossible to get such action out of the manufacturers as a whole.

C. W. CHURCHILL, GENERAL SALES MANAGER, BUICK MOTOR CO.: While favorable to the Windsor Plan, I do not believe it is the final solution to the used car situation, although it has sufficient merit in it to at least relieve existing conditions. To date we have heard very favorable reports on the plan. Certainly anything that can relieve conditions seems worthy of a trial.

E. H. McCARTY, GENERAL SALES MANAGER, NASH MOTORS CO.: We are willing to recommend any used car plan that will help our dealers merchandise used cars in a better way. We are not convinced that the Windsor Plan will do what is claimed for it. We have been willing to cooperate with and encourage our dealers to enter with other dealers in those cities where the plan was to be tried, feeling that the best way to learn whether the plan had real merit or not was to have it tried and let results prove its worth. We have no desire ourselves to recommend a general adoption of this plan until it has been given a more thorough try-out.

D. S. EDDINS, VICE-PRESIDENT AND GENERAL SALES MANAGER, OLDS MOTOR WORKS: We believe if properly handled the Windsor Plan is a step in the right direction. We have recommended it to dealers as something worthy of a trial, and, while it is somewhat new, our dealers who are participating in it have spoken well of it.

R. S. COLE, GENERAL SALES MANAGER, HUPP MOTOR CAR CORP.: The Windsor Plan has made great gains and we are recommending it to our dealers. We believe its adoption would relieve the used car situation and would educate the public with what they should get for a used car. It is the best general plan for use in the whole United States, in our opinion.

R. H. GRANT, VICE-PRESIDENT IN CHARGE OF SALES, CHEVROLET MOTOR CO.: I am favorable to the Windsor Plan and I believe any commodity with as broad a sale as used automobiles needs constructive work to stabilize the market. Chevrolet has received many favorable reports from dealers and the company is giving considerable attention to a study of the situation.

SID BLACK, GENERAL SALES MANAGER, CHANDLER-CLEVELAND MOTORS CORP.: We do not know enough about the Windsor Plan at the present time to give an idea of our attitude toward it. We should be inclined to encourage any plan which would be helpful to the dealers in handling their second-hand cars or their trade-in proposition. If it were possible for the dealers' associations, in each town, to stick together and work in harmony,

campaign to cover a period of months and calling for insertion of the advertisements at stipulated intervals. After the first advertisements have been compiled it is the policy to have the newspaper telephone each dealer and have him bring up to date the quotations on cars in his particular line. Dealers do not agree to abide strictly by the prices appearing in the paper, but one thing is taken as quite certain, and that is, that no one can sell a used car to the public at a price higher than quoted in the advertisement. Knowing this, wise dealers naturally let the prices guide them when they come to take in used cars in trade.

Because of heavy advertising expenses which usually exist in connection with the Windsor Plan, it has been adopted far more extensively in smaller places than in large cities. Whatever the merits of the plan may be, it certainly has had a notable and rapid spread among the smaller communities. In three of the larger cities in which it has been adopted, Milwaukee, Akron and Indianapolis, free advertising rates have been granted by newspapers. Another interesting case is that of Fort Wayne, Ind., which is reported as being the only city in the United States where the plan was tried and dropped. Reports, however, indicate that the cause of this was the failure of the dealers to raise a sufficient advertising fund in advance to guarantee a good, fair trial. It is understood, however, that the plan is again being placed in operation in Fort Wayne and that the necessary space for the advertisements is being donated gratis by the publishers of the newspapers.

to Say About the Windsor Plan

we believe the manufacturers might be able to agree on some idea, but from what I have learned since I have been in business, the dealers will not stick together—and it has been tried in a great many towns in this country. We have no fault to find with the Windsor Plan, and no recommendation to make. We are watching its functioning in Des Moines and Milwaukee; in the course of three or four weeks we undoubtedly will know more about it.

L. F. MURPHY, GENERAL SALES MANAGER, VELIE MOTORS CORP.: I can assure you, while the merits of the Windsor Plan are, as yet, problematical, we are very interested in learning to what extent its benefits can stabilize trade-in appraisals and used car values. A few of our dealers are associated with the operation of this plan in the Middle West and have reported encouraging indications. In view of the fact that the success of the Windsor Plan depends considerably on the organization of local dealers, it hardly appears possible for manufacturers to act, except in a body. It is very evident to me that factory trading allowances or other periodic concessions which encourage exorbitant allowances on trade-ins do not further the stabilizing influence this plan appears to offer.

C. ALFRED CAMPBELL, SALES DEVELOPMENT MANAGER, STUTZ MOTOR CAR CO. OF AMERICA, INC.: It is my personal opinion after having perused the Windsor Used Car Plan that it has certain possibilities through which the dealer can benefit. During the last three years there have, of course, been a great number of suggested plans which range all the way from simply using common sense on up to an iron-clad organization bound by oaths and rigid regulations. Practically all of them have had some merit and have worked to some extent but none of them has proved to be a cure-all, or for that matter of very definite and lasting benefit. I feel that one of the chief advantages of the Windsor Plan is that it is comparatively simple and for that reason stands a much better chance of being successful than any plan which is more elaborate. Furthermore, as I understand it, it does not require any agreement of the dealer to buy or sell at a certain price but simply functions because of the publicity given used car prices. If any one of our distributors should write me stating that they were contemplating the Windsor Plan in their city and asking for my advice I would say: "Go into it." I don't believe the Windsor Plan has yet reached a stage where the manufacturers as a group should try to force the dealers into using it.

F. B. WALKER, GENERAL SALES MANAGER, FRANKLIN AUTOMOBILE CO.: The attitude of our company towards the Windsor Plan is favorable. We have already encouraged our dealers through our weekly publication and by special letters to cooperate with other dealers in their respective communities. We think that automobile manufacturers either as a group or individually should sponsor the plan with their dealers. We believe that group action will be for the best interest of all concerned and will result in a more uniform adoption of a plan which we consider to be helpful. We do not look upon the plan as the solution of the so-called used car problem, but we do believe that it will be helpful in stabilizing used car prices.

J. W. HUTCHINS, USED CAR MANAGER, DODGE BROTHERS, INC.: We are for the Windsor Plan. As we see it, it is the first thing that has been done to educate the public and anything that can be done to educate the masses on the value of used cars is valuable. We are recommending that our dealers enter the plan in cities where it is being inaugurated.

LYNN McNAUGHTON, VICE-PRESIDENT, CADILLAC MOTOR CAR CO.: I am thoroughly in favor of the Windsor Used Car Plan provided it works out as it has in the cities where it has already been tried. It looks favorable. It is not suggested as a panacea for the used car problem but is suggested as a help and it will be a help to every honest automobile merchant. The fact that it does not depend for its operation on a few men outside one's business but is a self-regulatory bulletin that keeps the public informed of the true market value of used cars, is to me one of its outstanding advantages.

J. E. FIELDS, VICE-PRESIDENT IN CHARGE OF SALES, CHRYSLER SALES CORP.: The Chrysler organization is favorable to the Windsor Plan. It is not my belief that the Windsor Plan is a cure-all for the used car ills which we hear so much about. This problem is one which has too many angles for any single plan to completely remedy. When one considers the used car situation there are many angles which enter the picture, three of which, to my mind, are outstanding: First, that the dealer accept only salable cars in trade; second, that he take them in at the right price, and third, that he have the proper facilities for merchandising them. In other words the used car problem is one which concerns the merchandising ability of each individual dealer. The one outstanding thing about the Windsor Plan which appeals to me is that it does not involve complicated agreements.

From all appearances, one of the great needs of the dealers in offering cars is to have a sales presentation aimed at securing free publicity. There are a number of arguments that can be given to newspapers along these lines but all dealer organizations are not sufficiently acquainted with newspaper ways to make the presentation. Besides the cities already mentioned in the United States which have adopted the Windsor Plan there are the following: Des Moines and Ottumwa, Ia; Louisville, Chattanooga, Little Rock, Toledo, Rochester, Elmira; these points in Minnesota: Minneapolis, St. Paul, Rochester, Winona, Mankato and Montivedeo; Fargo, Bismarck and Grand Forks, N. D.; and Duluth.

An important development in the Windsor Plan has been made by the dealers of Milwaukee and Des Moines, who have worked out a system whereby prices based on cars actually sold instead of quotations obtained by the various dealers making appraisals, are published. The dealers of these two cities have postcard forms which they fill out with the selling price on a used car when a transaction is made. The secretary of the association averages the prices, which come in from all dealers and not only from the dealer handling the particular make.

Over-Appraisal an Objection

By this means the tendency toward over-appraisal, which has been one of the big objections to the plan, is overcome. But even this device is not necessary, according to the dealers of Windsor, who declare the over-appraisals tend to be cut down over a period of time as the guilty dealers find themselves loaded with cars taken in at too high a price and in self-defense they have to come down even where at the outset prices were fully quoted. After a period of months a general cut could be made in these prices, as it is held that the working of the plan has resulted in a general lower used car valuation that is benefitting the trade.

Still another important development in the plan is found in Toledo, where the dealers run the advertisements under the auspices of the Better Business Bureau, the idea being to give to the public a greater guarantee of the authenticity of the quotations. The Toledo dealers are also understood to arrive at their appraisals by having committees representing various price groups meet and thresh out this point. Persons who have visited Toledo and observed the operation of the plan there are of the opinion that the Toledo dealers have an ideal program.

A frequently heard objection is that the advertising of prices will slow up sales, at least for a time, as the emphasis is placed on the trade-in rather than the new car and there is no chance to sell the customer on a new car before breaking the bad news to him of the low price he is going to get for his used car. A mere examination of prices may prove such a shock that a prospect will decide to run his old car rather than think any more of purchasing a new one. But against this is advanced the thought that prospective buyers are bombarded with advertising and sales talks on new cars all the time and they have a general desire for and the feeling of prestige in the getting of a new car at whatever sacrifice of unused transportation in the old car. Furthermore, it is held that, even if there is a temporary slowing up, in the long run the trade and industry will be benefited through the education of the public to not demand excessive trade-in allowances.

Again, it is said that dealers, locally, or through pressure from their factories, may withdraw if the second-hand value of their cars as advertised makes such a bad showing that sales are adversely affected. A small number of such withdrawals need not wreck the plan, as the remaining dealers can quote prices on the lines that they have withdrawn and where there is a price reporting system there will still be an average price on the line. On the other hand, the cost burden on the dealers that remain in the plan, where the advertising is paid for, will be a serious factor. Many believe that in the long run the newspapers will be obliged to print the prices as a matter of news, just as they now print stock quotations. The point is made that, with the possible exception of the larger cities, there are probably more persons interested in used cars than in stock market quotations.

Studebaker Views

The views of the Studebaker Corp. of America, as expressed by Paul G. Hoffman, well expresses the views of many of those manufacturers who do not look favorably on the Windsor Plan. Studebaker, Mr. Hoffman points out, has issued no dictum to its dealers advising against going into the Windsor Plan. On the contrary it has permitted its own retail branch in St. Paul to join with other dealers in the experiment. The belief of the Studebaker factory, however, is that "the Windsor Plan contains elements of disadvantage which more than offset its advantages." Mr. Hoffman says in part: "If the prices given by the dealer are accepted without challenge, there is no assurance that they will be accurate. The dealer with a long discount can well afford to set forth a fictitiously high resale price on his product for he would be willing to pay that price if called upon to accept it in trade. If the quotation as to resale prices were challenged, hard feeling would be likely to result . . . . For the automobile industry as a whole, the advertising of used car prices is quite apt to have a discouraging effect on the new car market."

Another objection against the plan is that it strikes very seriously at the small producer or the producer who has made a drastic change in models, and therefore whose used car prices show up very badly. This is not a universal condition. It is said, on the other hand, that some small producers have very excellent used car values, especially those who are making good headway in development of sales. Even strong companies in the high-priced field find a heavy rate of depreciation in used cars but they are able to sell their customers on prestige and pride of ownership, with the price consideration secondary.

Trade-in Allowances

Again it is pointed out that dealers in some lines have a trade-in allowance which enables them to appraise cars above their value more safely than the dealer not so favored. This is no new condition, of course, and it may be that advertising of prices would not aggravate its seriousness. However, this, like all other objections based on over-appraisals, is overcome by the price reporting system.

Along the same lines is the point that strong manufacturers occasionally feel the need and have the power to use the big stick over their dealers to raise trade-in allowances to aid in the relief of a condition of overproduction, either on the whole line or on a particular model. There is less of this than formerly and if the Windsor Plan is sound it seems too bad that an unsound practice should be allowed to interfere with its successful working out.

Again where the price reporting system is used, a dealer could not raise his appraisal; he would have to withdraw entirely, and even so his prices would continue to be quoted.

Just Among Ourselves

Not as Much "Shopping" as Generally Supposed

MAYBE prospective new car buyers don't shop around for offers on their used cars to as great an extent as we all have been thinking. Along with plenty of others in the industry, we have talked a good bit about the tendency to shop, but up to the other day we never saw any specific figures by which the extent of the practice might be gaged. A group of Baltimore dealers recently associated in a used car appraisal bureau plan, have produced actual figures about shopping practice in 2525 cases. Out of the 2525 original appraisals reported to the bureau during one given period, only 432 or 17 per cent of the prospects went to a second dealer. Only 119 or 4 per cent tried a third dealer and but 49 or less than 2 per cent went on to a fourth dealer. Four people out of the group shopped around to six dealers and one got appraisals from nine dealers. If this Baltimore experience can be considered as typical in any sense, it should help materially to strengthen the backbone of dealers as regards trading practices. Conditions aren't nearly so bad as we have been thinking if only 17 per cent of the prospects who ask a dealer to appraise their used cars are going to the trouble of asking even one other rival dealer to make an appraisal as well.

* * *

Questions—Now You Ask One

WHAT proportion of the total business did the Blank Company do last year as compared to the proportion it did the year before? In what year did that company build its greatest percentage of the total output? Those are pertinent questions for any company executive to ask himself about the performance of his own organization or that of his competitors. Looking back over the records beginning with 1917, plenty of interesting facts crop up when these questions are asked as regards specific companies. Take last year, 1926, for instance. What companies built a larger percentage of the total production in that year than they had done in any previous year? Well, here they are: Chevrolet, Chrysler, Essex, Lincoln, Locomobile, Nash, Packard, Peerless, Pierce-Arrow, and, of course, Pontiac.

* * *

Ford Reached His Peak in That Year

FORD, it is interesting to note, reached his peak for the period mentioned in 1921 when he produced nearly 60 per cent of the total cars built by the industry. Other cars which reached their highest percentage of total production in that same year were Gardner, H.C.S. and Haynes. Anderson, which went out of the picture about 1925, reached its high point in 1918; Apperson in 1919; Cole in 1919, Dorris in 1920 and Rickenbacker in 1925.

* * *

Lindbergh's Fuel and Oil Cost $85.80

HAVE been doing some multiplication in connection with Lindbergh's New York-Paris flight and find that he burned about $74 worth of fuel on the trip of 3600 odd miles. This is arrived at by assuming that he paid 20 cents a gallon for the 370 gallons of gasoline consumed. The 11.8 gallons of oil which he used, at $1 a gallon, which ought to be a fair price, would cost him $11.80. Thus the total expense of the trip, insofar as fuel and oil were concerned, was $85.80. On the basis of distance covered, fuel consumption was at the rate of 9.7 miles per gallon and oil 305 miles per gallon.

* * *

Enthusiasm May be Good or Bad

HARKING back for a moment to our discussion about rigid and flexible minds, the quality of enthusiasm—a quality which has been so potent in bringing about automotive development—is worth studying and analyzing a bit more than most of us are prone to do. Without enthusiasm our great industry never would have been built, but neither would the finer exploits of Jesse James ever have been achieved. The direction as well as the degree of enthusiasm is of tremendous importance. Enthusiasm in a rigid mind bound in by false prejudices brings results just as violently tragic as does enthusiasm in a flexible mind bring about results marvelously constructive. Which brings to mind a few potent phrases delivered by Dr. Nicholas Murray Butler at Columbia commencement the other day, when that very practical academician said: "The divine possession which is enthusiasm in a literal sense, stands in opposition to that cold indifference which follows upon its absence . . . . For us the term has come to mean intense and ardent feeling for a principle, a cause, a person. Does this intense and ardent f e e l i n g help and strengthen the intelligence or does it weaken and even destroy the power of sober and systematic expression?" The question is interesting to think about at any rate.—N.G.S.

A. A. A. Bus Operators Discuss Interstate Regulation

Subject leads all others in interest at first annual meeting of organization. Regulation deemed desirable but exact form it should take still remains to be decided.

By K. W. Stillman

REGULATION of motor bus interstate transportation appeared to be the subject of most interest to the members of the Motor Bus Division, American Automobile Association, at its first annual meeting held in Philadelphia last week. While it appeared to be the popular opinion that regulation is desirable, there was a bit of difference among the speakers as to just what form this should take.

The suggested legislation which has been offered to Congress during the past year has been more or less predicated on the assumption that regulation should begin with the smallest political bodies, and as problems arose further power should be given to larger political bodies, so that finally the Federal authorities would only have such powers as could not be delegated directly to States and municipalities.

This viewpoint apparently expresses the opinion of the majority but there are still many who look upon the confusion which has already arisen in license regulations as a warning of what might well happen to interstate commerce were the regulating powers to be distributed among various State commissions.

H. G. Wells, commissioner of public utilities, Massachusetts, who was a member of the special committee of the National Association of Railroad and Utilities Commissioners to formulate a proposed regulatory code for interstate bus transportation, outlined in his talk the many differences of opinion which were voiced during the hearings held by the committee. He is inclined to believe that regulatory authority should come from the bottom upwards if means for settling controversial points between States are provided.

According to S. A. Markel, chairman of the Legislative Committee of the A.A.A. Bus Division, the principal item in which the proposed legislation failed to meet with bus operators' approval was in its refusal to recognize bus transportation as a distinct type of service to be regulated without regard for other forms of transportation. He expressed the belief that the dislike of Federal regulation held by many operators is due to their fear that once given authority over interstate traffic the regulatory body may extend its power to cover intrastate traffic as well, just as the Interstate Commerce Commission has done in regard to railroad operation.

Because bus lines are generally relatively short and serve only a small territory it was thought their regulation could be handled most satisfactorily by local bodies which would be more familiar with the particular conditions than any Federal body could hope to be.

Judge Sanders, transportation commissioner of West Virginia, seemed to express the sentiment of the gathering in saying that the necessity for regulation is not in question but its character is the problem now to be solved.

It was emphasized by several speakers, and particularly by T. R. Dahl, White Motor Co., that bus transport should be treated as a problem separate from other forms of transportation. It was his belief that the regulations in force in some States which forbid the operation of a bus line along a route paralleling a rail line while the latter has the capacity to handle the available traffic is unfair to the public in not permitting them to select for themselves the kind of transportation they desire and is having a detrimental effect upon the growth of motor bus operations.

According to Henry R. Trumbower, professor of economics, University of Wisconsin, much of the confusion caused by wide divergence in State regulatory measures has been caused by a lack of data upon which the various legislative bodies might base satisfactory regulations. He cited the numerous methods used for determining license fees in the various States as an example of what may occur when legislatures feel the need for restrictive and regulatory legislation before there is adequate data available upon which to base such actions. He suggested that the A.A.A. and its Bus Division might be of great help in obtaining more uniform laws effecting motor vehicles by making itself a repository and collecting agency for the type of information necessary for the proper preparation of legislation.

The relationships between bus operating projects and the electric and railway interests is of great importance for both and this subject, of course, received considerable attention at the meeting. In his address, A. J. Brosseau, president, Mack Trucks, Inc., said that while the place of rail lines in handling mass transportation in congested centers appears at the moment to be secure, it should not be forgotten that the bus industry is still young, it has a field of its own and renders a service which is different in character from that given by any other transportation agency.

He would not undertake to say at what point of thinning density the bus begins to give a better all-round service but he called attention to the fact that buses have been substituted for trolley systems in 65 towns and cities, all of them under 100,000 population.

Whether buses can replace trolleys in larger cities can only be determined by future experience, he believes. It is not known definitely now, for although there are many "experiments" proving one side of the argument, there are just as many on the other.

In this connection, J. A. Ritchie, Yellow Coach & Truck Mfg. Co., said that the argument between buses and rail cars for the handling of mass transportation can be settled by considering just three points. The ability of either to handle mass transportation economically is based upon (1) rail or street capacity; (2) vehicular capacity and (3) relative cost of operation of the vehicles.

Compares Bus and Trolley

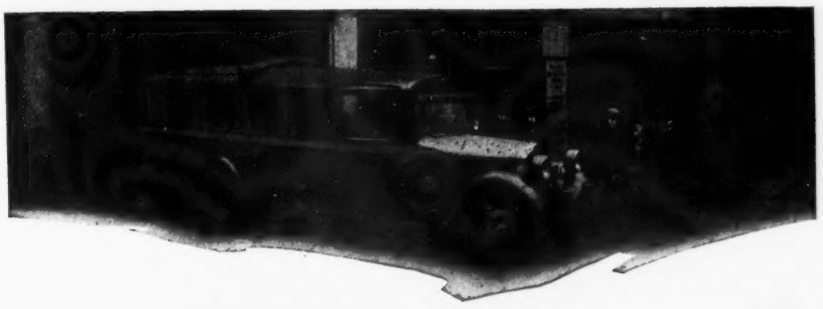
It is obvious, he said, that the capacity of the entire street surface of a city is much greater than the rail capacity. As for vehicle capacity, he cited the average street car as accommodating from 44 to 46 seated passengers while the modern double deck bus provides seats for 67 passengers. As to the extra standing room furnished in trolley cars, he suggested that while rail cars are about 40 ft. long on the average, buses are only some 30 ft. long and could quite easily be increased in size to equal or exceed the full load capacity of the average trolley car.

These two conditions being met, the only other question would be that of determining which of the two vehicles could be operated most economically. He offered no opinion on this subject but left the suggestion with his audience that if buses could operate as cheaply as rail lines there is no reason why they cannot be used economically to handle mass transportation.

This opinion of Mr. Ritchie's was opposed by most of the electric railway men who spoke. Bert W. Arnold, Chicago Elevated Railways, for example, expressed the opinion so prevalent among railway men that in mass transportation the bus is not a substitute for the electric railway. Mr. Arnold also stated that he believed the bus was not adapted for rapid transit service nor for interurban work but should find its field of greatest usefulness in conjunction and cooperation with existing rail lines rather than in competition with them. He was strongly of the opinion that the future of the bus industry lay in the hands of the railway interests who have had experience in transportation matters and that the economic relation between the two is so close that they should never be separated.

In spite of the fact that Mr. Arnold and those who agreed with his view seem already to have decided that buses have no place in mass transportation, he assured the bus industry that the electric railway interests were willing and ready to give this new form of transportation every possible advantage in an effort to develop it to its greatest usefulness.

There appeared to be ample evidence that electric railways, if at one time they were opposed to bus operations, have now changed their views and are willing to give buses a chance to prove themselves. Possibly the strongest evidence of this is to be found in the make-up of the Bus Division itself. The Bus Division of the A.A.A. was formed some 15 months ago to represent all the parties interested in the development of the bus industry. The division now has a membership of 1900 operators running 16,000 buses, or about 45 per cent of all buses being operated as common carriers. In this number is included a very considerable number of operators affiliated with electric and steam rail companies.



Many of the big electric utility companies operating large numbers of buses were already members of State bus organizations, and, of course, these State associations have formed the nucleus on which the Bus Division is building. In all the organization work the Division workers have found railroad companies cooperative, so that it appears to be generally true that whatever might have been the conditions in the past, today both utility and independent operators have come to the conclusion that they have more to gain by working together for the common good than in further guerilla warfare.

Although comparatively young, the Bus Division has already accomplished a great deal and if its activities during its present short life may be taken as a promise of its future it is likely to become a most valuable organization for its members.

The activities were outlined by A. M. Hill, chairman of the division, at the joint luncheon at which the members of the new body were introduced to the general membership of the A.A.A.

The initial membership consisted of about 1100 operators and 6000 buses which has now grown to the number cited before. There are 19 State and district associations now affiliated with the division, and by the end of this year it is expected to have complete geographical representation of the bus operators of the country.

The most notable activity of the division has been in connection with interstate regulation of bus operation. The division cooperated with the various State associations in the presentation of testimony before the Interstate Commerce Commission during its hearings last year and, it is believed, contributed greatly to the success of these investigations.

Bus Division Activities

The division was active in gaining repeal of the war excise tax on new automotive equipment and this saving to its members alone amply repaid them for their membership. Constant contact has been carried on with public service commissions, State legislatures, courts and trade associations and the news and information obtained from these contacts has been passed on to the industry through and in connection with the Bus Division.

Facts and figures regarding the bus industry have been compiled and at the convention there were distributed copies of a booklet containing much valuable information relating to the industry which has been unavailable hitherto. Early this year the division completed and released for distribution the first of a contemplated series of State Bus Guides and Maps, by means of which the traveling public can plan long distance trips by bus with the same ease that a railroad journey is prepared for. This first consolidated timetable covers Maryland, Delaware, District of Columbia and parts of Vir-

ginia. It is arranged in the manner of a railway timetable and contains an index of all towns and cities listed in the tables.

The Bus Division expects to either publish these timetables for other sections of the country or to assist in their preparation so that soon there will be available for the public complete and accurate information covering bus line operations in all parts of the country.

Later a bus tour service will be organized and steps will be taken to secure wide publicity for this type of information. Other activities of the division include the circulation of information of interest to the industry and the distribution of educational printed matter dealing with operation and regulation of bus transport.

Nearly every member now a member of a state association affiliated with the Bus Division is displaying the standard A.A.A. emblem on the radiator of his buses. This is a valuable asset in building up good will for the operator since this emblem is well known to the public through the work of the parent association, which is generally recognized as a constructive agency in the motoring field. To still further heighten the effect of this practice the Division is preparing placard advertisements for display in buses which emphasize the significance of the A.A.A. emblem.

The program of future activities includes the conduct of research work in bus transportation, the compilation of comprehensive bus cost and operating statistics, etc. In addition it is planned to formulate a uniform bus law for the regulation of intrastate carriers which will be available for the guidance of state legislatures is framing regulatory legislation. This work is expected to assist in the elimination of the conflicting requirements now found in the laws of various states.

Although considerably handicapped in some respects, the Bus Division has already shown its ability for constructive service to the bus industry. A national organization devoted to the promotion of bus transportation within its economic sphere is essential to the growth of this relatively new form of transport service. Without a strong national organization such as the division is rapidly becoming, the natural development of the industry might be greatly hampered by other interests in the transportation field which are organized to present their views more effectively.

The Bus Division of the A.A.A. has the support of the National Automobile Chamber of Commerce so that it may also provide a medium through which may be worked out some of the difficulties which have arisen from time to time between bus manufacturers and operators. In all of its activities it appears to be of real value and service to all parts of the bus industry and so should receive the hearty support of all who are interested in securing the greatest possible development for that industry.

Rumanian Tariff on Cars and Parts Changed

A NEW tariff went into force in Rumania on April 14 last which changed the rates of duty on automobiles and automobile parts. The duties are based on weight and are expressed in gold lei per 100 kg. (220 lb.). Heavy vehicles for the transportation of merchandise and special vehicles, such as motor tank wagons, motor street sweepers, motor sprinkling wagons pay 15 lei per 100 kg. when weighing 3000 kg. or more, 12.50 lei when weighing from 1500 to 3000 kg., 10 lei when weighing less than 1500 kg. Motor buses with body pay 37.50 lei per 100 kg.

Chassis for automobiles or electromobiles, with or without motor, for the transportation of passengers or merchandise, pay 10 lei. Bodies for commercial vehicles, even when not finished, pay 50 lei. All of the above weights are gross weights, while in the following items net weights are understood.

Passenger car open bodies (torpedo) even when unfinished, 50 lei per 100 per kg. when weighing less than 300 kg.; 42 lei when weighing between 300 and 500 kg.; 200 lei when weighing more than 500 kg. Passenger car closed bodies (coupe, sedan) 150 lei per 100 kg. when weighing less than 300 kg.; 250 lei per 100 kg. when weighing between 300 and 500 kg., and 350 lei when weighing over 500 kg. Passenger car closed bodies with partition between front and rear seats (limousines, etc.), 200 lei per 100 kg. when weighing less than 300 kg.; 370 lei when weighing between 300 and 500 kg., and 500 lei when weighing more than 500 kg.

Open type automobiles for the transportation of tourists (torpedo), 10 lei per 100 kg. when weighing less than 1000 kg.; 24 lei when weighing between 1000 and 1200 kg.; 74 lei when weighing between 1200 and 1500 kg. and 124 lei when weighing over 1500 kg.

Passenger cars with closed bodies and without partition between front and rear seats (coupe, sedan, etc.), 50 lei per 100 kg. when weighing less than 1000 kg., 74 lei when weighing between 1000 and 1200 kg.; 100 lei when weighing between 1200 and 1500 kg., and 150 lei when weighing more than 1500 kg.

Passenger cars with closed bodies with a partition between front and rear seats (limousine, etc.), 62 lei per 100 kg. when weighing less than 1000 kg.; 86 lei when weighing between 1000 and 1200 kg.; 124 lei when weighing between 1200 and 1500 kg., and 200 lei when weighing more than 1500 kg.

Parts and accessories for automobiles, replacement parts imported separately and not enumerated in any other part of the tariff, 19 lei per 100 kg. when unfinished and 62 lei when finished.

Motorcycles, sidecars, bicycles and tricycles with motor, as well as parts and accessories for motorcycles, 50 lei per 100 kg. of gross weight.

In addition to the tariff duty scheduled in the foregoing there is a luxury tax of 15 per cent ad valorem on passenger cars weighing more than 1500 kg.; a luxury tax of 10 per cent ad valorem on open and closed bodies, open and closed automobiles weighing between 1200 and 1500 kg. and finished parts for automobiles. A surtax of 2 per cent ad valorem is levied on all articles not subject to the luxury tax.

A NEW Junkers cabin monoplane fitted with sleeping compartments for 15 passengers has been recently completed and after undergoing tests will be placed in active service, probably in Europe, in extended flights. The plane is an all-metal type with approximately 67 ft. span, 53 ft. long, and 20 ft. high. It is powered with three motors, two being mounted on the wings, which develop a total of 1200 hp. and provide a speed of about 115 m.p.h. New features of the machine are a separate room in which are installed auxiliary engines and apparatus for supplying lighting current, a separate navigating compartment, and ample spaces beneath the cabin for storage of baggage.

Bosch-Acro Diesel Engine Embodies New Combustion Principle

Air travels upward from pocket in piston and mixes with fuel in small venturi where combustion takes place at a rate which varies automatically with engine speed.

By P. M. Heldt

IN the March 12 issue of *Automotive Industries*, in describing the fuel pump and injector valve which had been brought out by the Robert Bosch Magneto Co., Inc., for automotive-type Diesel engines, we pointed out that the patents of the Acro company, under which the Bosch company operates, also cover other features of the engine besides those dealt with in the article. One of these features is the peculiarly shaped combustion chamber. Concerning this no information could be given at the time owing to the state of affairs with respect to patent protection.

The great problem confronting the designers of high-speed Diesel engines is that of effectively distributing the fuel throughout the air charge during the exceedingly short period available for this operation. In attempts to solve this problem, many different forms of combustion chambers have been evolved. In the Bosch-Acro engine a three-part chamber is used, as illustrated in Fig. 1.

The cylindrical wall of the piston is carried up beyond the piston head and is provided with an inward flange, into which is set a steel cup. Into the latter is set a flanged aluminum plug having a funnel-shaped opening through it, the cup and plug being held in position on the piston by means of a flat ring, which itself is secured to the inward flange of the piston by three cap screws. The top of the ring is flush with the top of the cylindrical wall of the piston, and when the piston is at the upper end of its stroke there is only a slight clearance between it and the cylinder head. The three parts of the compression chamber therefore are. (1) the space in the steel cup; (2) the funnel-shaped space in the aluminum plug, and (3) the small-depth clearance space between the piston and cylinder head.

It has been claimed in Germany that the arrangement described is only a variation of the well-known ante-chamber form of combustion head, and this view may have received support from the fact that in an earlier patent issued to Franz Lang of the Acro company the space within the cup is referred to as a supplementary combustion chamber. The Bosch company denies any relationship between its latest construction and the familiar ante-chamber type of cylinder head. According to Nagel (*Zeitschrift des Vereines Deutscher Ingenieure*, Vol. 67, p. 778), an essential characteristic of the ante-chamber type of Diesel engine is very effective throttling between the ante-chamber and the compression space within the working cylinder. The passages through which the two communicate are of such small section that the partial combustion in the ante-chamber results in an appreciable excess pressure therein. Any comparison of the new engine with the ante-chamber type must be made on the basis of this characteristic of the latter, and the Bosch company points out that a valid conclusion may be based even on the dimensional proportions, while the differences between the two types are brought out much more clearly and conclusively by the results of a scientific investigation of the process of combustion.

Such an investigation has been made for the Bosch company by Prof. R. Stribeck, who is well known as a research worker, particularly in connection with the establishment of the scientific principles underlying the operation of ball bearings. Prof. Stribeck communicated his results in a paper recently presented to the *Verein Deutscher Ingenieure*, from which the following is abstracted.

The tests were carried out on a single cylinder four-stroke engine of 4.91 in. bore, 7.09 in. stroke and a con-

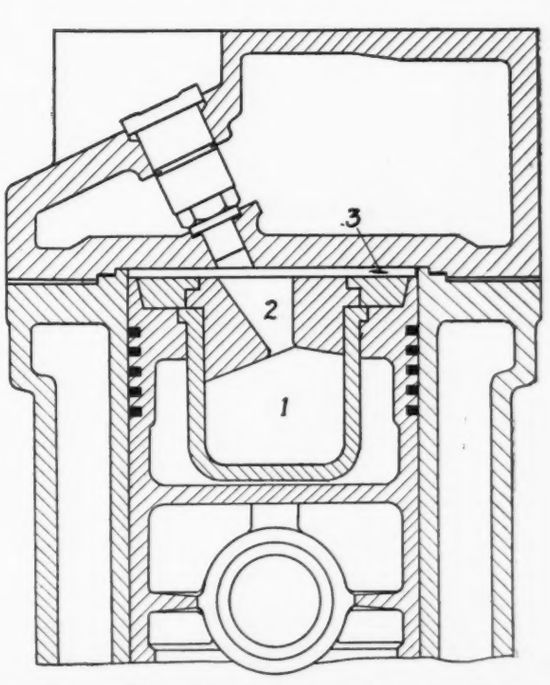


Fig. 1—The three-part compression chamber

necting rod length of 3.8 times the crank radius, the engine being designed for a normal speed of 800 r.p.m. The piston head, piston, injection pump and injection nozzle or valve of an ordinary solid injection type Diesel engine were replaced by the corresponding parts of the Bosch-Acro system, the valves and valve gear being retained.

With a total displacement of 134.7 cu. in., the compression space measured 8.54 cu. in., which was divided among the three parts of the compression chamber as follows:

	Part 1	Part 2	Part 3
Vol. in cu. in.	5.98	.61	1.95
Per cent of total	70	7	23

In the following discussion the funnel-shaped part of the compression chamber will be referred to as the ven-

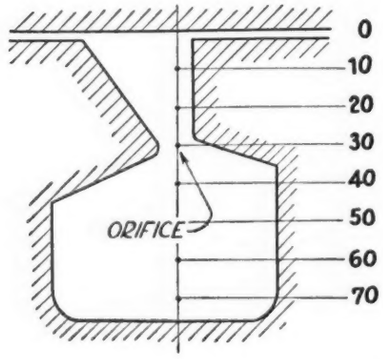


Fig. 2—Locations of the eight thermo-couples

turi and the opening between the venturi and the space in the cup as the orifice. This orifice in the test engine had an area of 0.181 sq. in.

First a series of tests were made to determine the pressure differences between parts 1 and 3 of the compression chamber. To this end a diaphragm type of pressure gage was used, the diaphragm being clamped at its edge and the chambers on opposite sides of the diaphragm made as small as possible and connected by small tubes to spaces 1 and 3. In the upper dead center position the tube to space 1 projected into the latter a distance of 1.57 in. The deflections of the diaphragm were measured stroboscopically by means of an electric spark produced at any particular position of the crankshaft. The pressure curve so obtained rises when the tube enters space 1, reaches a maximum value about 20 deg. ahead of dead center and decreases steadily from there on, with very pronounced oscillations at and near the upper dead center. Variations of the pressure difference will be discussed later on, in their relation to the actual process of combustion.

Temperature Measurements

The second and most important part of the investigation is based on temperature measurements. In order to explore space 1, a thermo-couple was introduced into it through the orifice, and the different points of temperature measurement are indicated in Fig. 2. They are located on a line parallel to the axis of the cylinder and a short distance from it, the figures at the different points denoting their distance in millimeters from the cylinder head. Point 70 is 40 mm. below the orifice when the piston is in the upper dead center. The temperature measurements made therefore cover all three parts of the compression chamber up to a piston travel of 40 mm. (1.573 in.), which is sufficient for an investigation of all the more important phenomena. The lowest thermo-couple remains in the venturi for another 28 mm. of piston travel, hence the temperature variation in this part can be investigated for a total of 68 mm. (2.67 in.) of piston travel. The mounting of the thermo-couple is illustrated in Fig. 3.

The first temperature measurements were made with the engine running at 400 r.p.m, as the extremely delicate thermo-couples were liable to breakage at higher speeds. Later on measurements were successfully made at 600 r.p.m., but only a few isolated results could be obtained at 800 r.p.m. Fig. 4 shows temperature curves for points 20.30 and 40 at 400 r.p.m.

Each curve in Fig. 5 represents the variation in temperature with time of one of the thermo-couples, or of the point in the combustion chamber at which this point is located. The crank angle is plotted on the axis of abscissas, and from the crank angle the piston position can be calculated, hence it is possible to determine for every point on each temperature curve the position of the point of measurement relative to the piston and, what is more important, with relation to the orifice.

When the crank has approached the top dead center to within 6 deg., temperature increase due to compression only ceases, and beginning at this crank position the temperature at point 20 rises rapidly from 930 to 2610 deg. Fahr. The peak, which is very pronounced, is reached at a crank angle of 33 deg., corresponding to about 0.71 in. of stroke. When the crank is in this position thermo-couple 20 is at about the upper end of the venturi. As the thermo-couple leaves the venturi the temperature drops slowly, the curve being comparatively flat, dropping by only 126 deg. Fahr. to a crank angle of 70 deg.

Point 30 also shows a pronounced and sudden increase in temperature starting at about 6 deg. ahead of top dead center. But in its case the temperature increase stops suddenly at 2065 deg. Fahr. and is followed by an equally precipitate fall. The very marked turning point corresponds to a crank angle of 10 deg. and a stroke of 0.08 in. The thermo-couple at this instant is also 0.08 in. above the orifice. For a crank angle of 17 deg. for which the point of measurement is 0.20 in. above the orifice, the temperature curve takes another sudden turn, and the temperature mounts rapidly from 1795 deg. Fahr. to 2470 deg. Fahr., while the piston moves to a point 0.83 in. from the upper dead center position. From this point on the curve is similar to that for point 20.

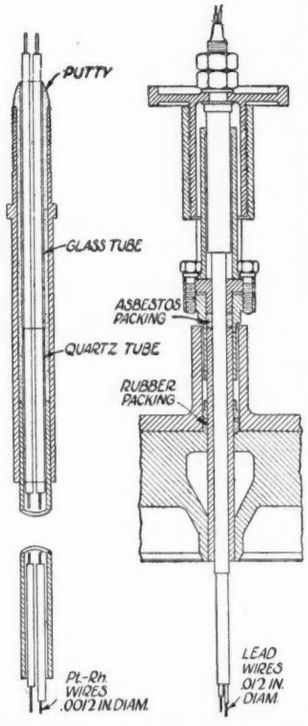


Fig. 3—Thermo-couple insert

During the power stroke, combustion and expansion are the factors affecting the temperature in the cylinder, and a sudden increase in temperature denotes that the thermo-couple is in a combustion zone. Very high temperatures—up to 3800 deg. were measured—can occur only where fuel and air are mixed in the correct proportion. Decrease in temperature due to expansion is less rapid and while the temperature increases as a result of combustion at a rate

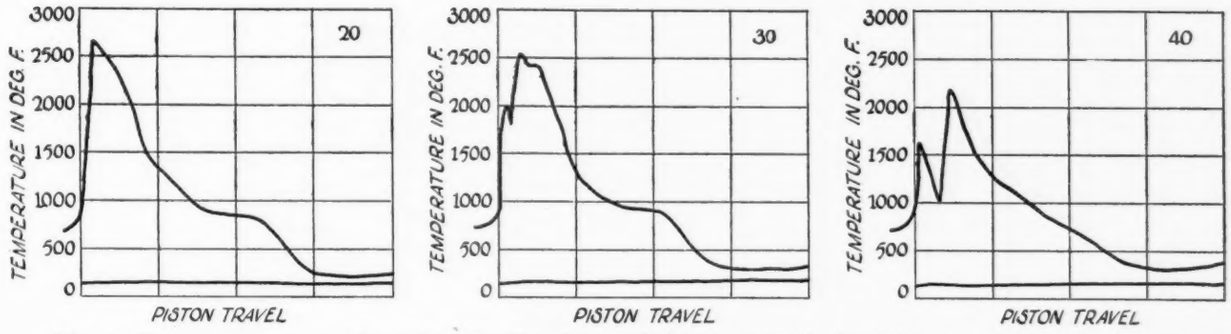


Fig. 4—Temperature curves for points 20, 30 and 40 and the power stroke for 400 r.p.m. and 68.5 lb. p. sq. in. m.e. p.

in some instances as high as 900 and even 1800 deg. Fahr. for 10 deg. of crank motion, the decrease in temperature due to expansion hardly exceeds 180 deg. Fahr. for an equal crank motion; hence the sudden drop in the temperature at point 30 while it moves from 0.08 to 0.20 in. above the orifice cannot be explained fully by ascribing it to expansion; this drop must be due in large part to the admixture of cooler gas, and the curves themselves furnish the answer to the question where this cooler gas comes from.

At this instant, when the temperature at point 30 is decreasing rapidly, points 0, 10 and 20, which are located above it, are at a higher temperature, indicating that they are in a zone of combustion; points 40, 50, 60 and 70, which at this instant are all in space 1, show temperatures sensibly lower than that of point 30. Therefore, the gas which causes the temperature reduction at point 30 can come only from space 1. Fig. 5 shows that the temperature rise at point 40 also is suddenly interrupted by the influx of cooler gas. This cooler gas comes into contact with the thermo-couple after only 0.040 in. piston travel and remains in contact with it up to 0.71 in. piston travel. At this latter point the thermo-couple has reached the limit of the zone of combustion, *i.e.*, it enters the border of a flame. This position corresponds to a distance of 0.315 in. of the thermo-couple from the orifice, upward. The curve for point 50 leads to the same conclusion. After having been cooled to 986 deg. Fahr. the couple enters the actual flame 0.160 in. above the orifice when the piston has traveled 0.945 in. on the down stroke.

As these points are of particular importance it is desirable to formulate them more clearly. The height of the border of the flame above the orifice is

0.197 in. when point 30 enters it (0.197 in. piston stroke).
0.315 in. when point 40 enters it (0.709 in. piston stroke).
0.157 in. when point 50 enters it (0.944 in. piston stroke).

Below the border of the flame there is cooler gas issuing from space 1. Above this border, combustion takes place from the moment of ignition. The position of the border of the flame relative to the orifice changes only slightly, moving downward with the piston between 0.197 and 0.944 in. piston travel. The temperature rises above 2375 deg. Fahr. only at points 0, 10, 20 and 30. When the piston is in the upper dead center position these points are on the face of the cylinder head and in the venturi respectively. The fact that combustion takes place at these points from the very instant of ignition, is not interrupted and produces such high temperatures, indicates that a good mixture is always there.

How Flame is Maintained

Having thus found the location of the flame, Prof. Stribeck next set about to discover how the flame is produced and maintained. In this connection a few points relating to the fuel injection are of interest. The jet of fuel is directed into the venturi and injection ends at about 15 deg. crank travel from the dead center point. The peculiar element in the combustion is the method of air supply. Considering the small volume of the venturi, combustion can be maintained in it for such a long period only if fresh air is brought in and the products of combustion are removed from it continuously. It will be readily seen that the gases of combustion are transferred to space 3 by the downward motion of the piston. The air necessary for combustion can come only from space 1, and the curves of Fig. 5 show that—disregarding an incidental disturbance which ceased at 0.080 in. piston travel—no combustion takes place in space 1. This space actually supplies air to the flame, and for this reason is called the air chamber. The whole process is similar to that in a blow torch.

In Fig. 6 the data is presented in a different way. The temperature variations along the line of measurement after 0.080, 0.197, 0.709 and 0.944 in. of piston travel are plotted. The relation of the upper edge of the venturi and of the orifice with respect to each curve is

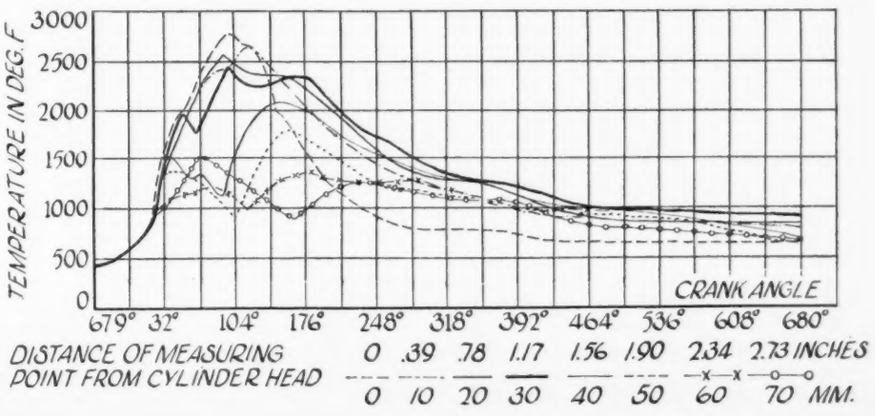


Fig. 5—Temperature curves for the eight points of measurement for 400 r.p.m. and 68.5 lb. p. sq. in. m.e.p.

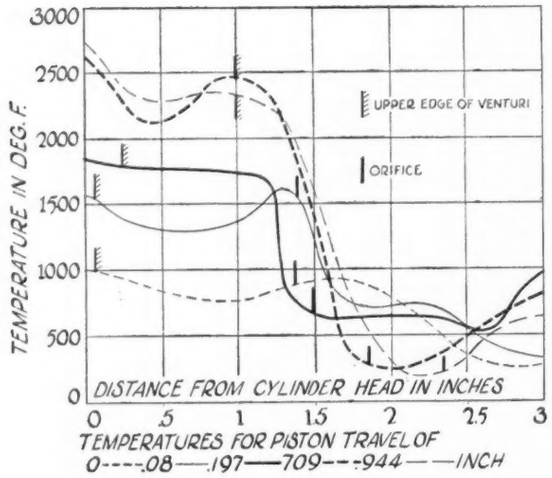


Fig. 6—Temperature variations along the line of measurement for different piston positions, the steep inclines indicating the limit of the hot zone

drawn in. It will be seen that the sudden rise in pressure (due to combustion) always begins very close to the orifice, the distance between the beginning of the incline and the orifice marking the distance between the flame border and the orifice. The curve for point 0 in Fig. 6 is said to be of somewhat doubtful accuracy owing to experimental difficulties.

Determining Ignition Point

Prof. Stribeck considers it impossible to determine, by means of stroboscopic temperature measurements, the exact point where ignition takes place, but says the question whether ignition takes place in chamber 1 or elsewhere can be definitely answered on the basis of these measurements. The curve for 0.080 in. piston travel in Fig. 6 shows that combustion takes place in space 1 only in the immediate neighborhood of the orifice and that the border of the flame retreats into the venturi so rapidly that after 0.197 in. piston travel it is already above the orifice. Moreover, the gases which follow the flame from space 1 give rise to a rapid and pronounced increase in temperature, hence they must contain a large proportion of oxygen. These two phenomena, he says, exclude the possibility of ignition taking place in space 1, as in that case the gases of combustion and air would be mixed. As soon as combustion starts in the venturi, a rise of pressure occurs, a stroboscopically-operated pressure gage connected to space 3 showing a pressure rise from 30 to 37 atmospheres (440 to 544 lb. p. sq. in.) during 6 deg. of crank travel. This comparatively small increase in pressure indicates that a rapid equalization of pressures takes place between the different parts of the combustion chamber, burning gases flowing from the venturi into the air chamber (space 1).

From the curves of Fig. 6 it may be seen that the temperatures in the venturi and at its orifice are very nearly the same. In the neighborhood of the upper dead center position the increase in pressure ceases and the higher pressure is now transferred from the venturi to the air chamber. Next a flow of gases from the air chamber begins, the hot gases which have just entered it flowing out first, followed by practically pure air. This explains the momentary disturbance mentioned in the foregoing.

In order to investigate the influence of loads, a series of tests was carried out at 400 r.p.m. with a m.e.p. of 47 lb. p. sq. in. and the results compared with those already obtained at 68 lb. p. sq. in. For the higher m.e.p. the zone of maximum temperature extends right up to the cylinder head, from the dead center position to 1.57 in. on the downstroke. For the lower m.e.p., on the other hand, the maximum temperature occurs at from 0.8 to 1.2 in. from the cylinder head. Temperature differences are even more pronounced during the expansion period, as may be seen from the following table:

For piston travel of	For M.E.P. of 68 lb.	For M.E.P. of 47 lb.
0.709 in.	2730 deg.	2145 deg.
1.57 in.	2640 deg.	1740 deg.
2.75 in.	1920 deg.	1150 deg.

While these measurements were all taken along a line parallel to the axis of the cylinder, Prof. Stribeck says they serve as a guide to the propagation of the flame and currents in a plane transverse to the axis of the cylinder. When, as in the case of the higher m.e.p., the hottest point of the flame is near the cylinder head, the flame will spread over the cylinder head and along the cylinder walls, in which case a great deal of heat is transmitted to the jacket water. At lower m.e.p. the flame is shorter and narrower. As the point where the flame is produced, and its length and width depend upon the form and dimensions of the venturi, they can be controlled by design.

In order to investigate the influence of speed, temperature curves were taken at 600 and 800 r.p.m. The results show that at each speed the hot zone extends into the cylinder about 1.18 in. after 0.315 in. of piston travel and that the maximum temperature attained does not differ much for 400 and 800 r.p.m., but is remarkably high at 600 r.p.m. The actual figures are given in the following compilation:

R. P. M.	**400**	**400**	**600**	**800**
M. E. P.	**47**	**68**	**82.5**	**77**
Highest temp. at 0.315 travel	**2470**	**2380**	**2995**	**2500**

The times necessary for the same piston travel are in the proportions 4:3:2. Therefore, the flame develops twice as fast at 800 and more than one and one-half times as fast at 600 as at 400 r.p.m. From this it is concluded that at the higher speeds combustion and the attendant production of heat take place much more rapidly than at 400 r.p.m. It would seem from the results obtained that the speed of combustion is directly proportional to the speed of rotation, and Prof. Stribeck observes that, if this is so, it opens prospects of running the engine at much higher speeds.

The test engine ran quietly and without visible exhaust at all speeds between 200 and 800 r.p.m., for all load conditions, from idling to full load. The load is limited by the appearance of smoke in the exhaust. If

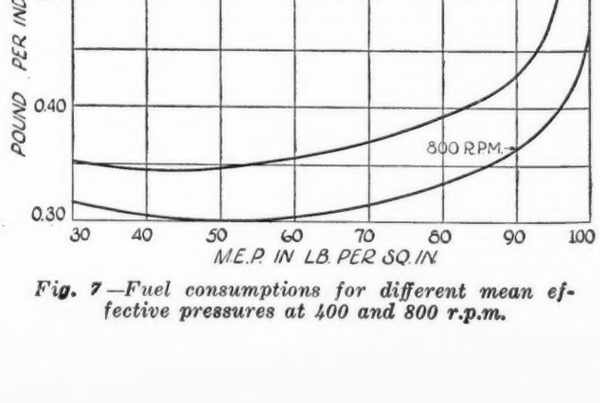


Fig. 7—Fuel consumptions for different mean effective pressures at 400 and 800 r.p.m.

the fuel is burned equally well at all speeds, then the m.e.p. and the specific fuel consumption based on the indicated hp. at the maximum load with smokeless exhaust should be the same at all speeds, and the following test results show that this is substantially the case:

R. P. M.	200	400	600	800
M. E. P.	95	101	92	91

The fuel consumption figures are also very much the same, as shown in Fig. 7. In a footnote Prof. Stribeck points out that these mean effective pressures and specific fuel consumptions should not be used in comparing the Bosch-Acro engine with other types of engine, as at the time the tests were made it was not possible to set the parts for the maximum m.e.p. and minimum fuel consumption, and much better values have been obtained since. The outstanding conclusion to be drawn from Fig. 7 is that for each speed the specific fuel consumption is substantially constant for a range in m.e.p. from 30 to 90 lb. p. sq. in.

This increase in the rate of combustion with the engine speed calls for an explanation, and Prof. Stribeck explains the phenomenon as follows: To insure this more rapid combustion at higher speeds it is necessary that the air flow out of the air chamber more rapidly. As a matter of fact, the excess of pressure in the air chamber, on which the rate of flow depends, increases with the engine speed. The tests referred to in the early part of the paper, relating to measurements of pressure differences between spaces 1 and 3, furnish the necessary data. These measurements, it is true, had to be confined to the end of the compression stroke, because if continued beyond the dead center the vibration of the diaphragm vitiated the results. For a crank position 20 deg. ahead of dead center the following excess pressures were measured in space 1 at different engine speeds:

R. P. M.	200	300	540	800
Atmospheres	0.2	0.28	0.75	1.8

If we assume that the flow is proportional to the square root of the excess pressure, we get the following comparative figures for the rates of flow:

Ratio of engine speeds (r.p.m.)	0.25	0.38	0.68	1.00
Ratio of rate of flow	0.34	0.40	0.68	1.00

The automatic adjustment of the rate of combustion to the speed of the engine is thus explained by the fact that the rate of flow of air from the air chamber varies automatically with and in proportion to the speed of the engine. This is said to be the most remarkable characteristic of the air chamber engine.

New Delivery Truck Has Three-Point Control

A NEW name appears in the truck manufacturing field with the announcement by the Divco-Detroit Corp., Detroit, of the development of a gasoline delivery truck having a three-point control and operating system particularly designed for house-to-house delivery work.

The new Divco truck has an 86 in. wheelbase with the motor mounted over the front axle. The driver, when going to and from the point of delivery, operates the truck from a forward, left-hand driving position with normal controls. These controls are connected with duplicate controls on either side, mid-way in the chassis where an operating platform is provided similar to that found on milk wagons and trucks.

At the sides of the frame are mounted the clutch and brake pedals and the speed change lever. Upon the latter is mounted a tube on the top of which is a handle with a reciprocating movement which controls the carburetor throttle valve. In the center of the chassis, midway between the two side operating platforms, is mounted a steering shaft connected with the front wheel steering gear so that the truck may be operated from either of three positions.

The motor is a Continental industrial, 3⅜ by 4¼ in., heavy duty low-speed type, with aluminum pistons, balanced crankshaft, pump water circulation and gear oil pump. Because of the fact that under the service for which it is designed the Divco truck engine will be idling for a considerable portion of the time it is operating, specially designed generator and ignition systems have been employed to provide high generator output at slow engine speeds.

The motor is mounted at four points on pads and springs. A small permanent hot spot is used between the inlet and exhaust manifold with a valve to regulate the amount of heat flowing around the carburetor standpipe. An oil filter is fitted and the entire system of carburetion and lubrication has been designed to reduce oil changes to not oftener than every 5000 miles.

A 10 in. single plate clutch is used. The transmission is a standard truck type with three speeds forward and reverse, except for the horizontal shafts extending from it to the side control stations. The rear axle is three-quarter floating type, bevel gear, with 7¼ to 1 ratio.

Two sets of brakes, 16 by 2¼ in., are mounted on the rear hub. One set is connected with the clutch pedals so that depressing the pedals 2 in. releases the clutch while further depression applies the brake. The second set, used for emergency, operates from a second pedal.

Front wheels, disk type, mounting 30 by 5 in. high pressure tires, turn at an angle of 37 deg., providing a turning circle of 32 ft. diameter. The frame is made of 5 in. channel steel with 1¾ in. flanges, reinforced with five cross members. Semi-elliptic springs 2¼ in. wide are employed.

Standard equipment includes full electric lighting equipment with head, two tail, instrument board and dome lights; ammeter, oil gage and gasoline gage on instrument board, and a delivery body of oak with plate glass windows in the upper panels of the two side doors and in the back of the body and in the large size, double-ventilating windshield.

In tests made by creameries over milk routes varying from 10 to 50 miles in length and having from 135 to 350 stops it is reported that Divco trucks showed an average cost of ten cents per mile including all charges.

A RECENT report of the Royal East African Automobile Association states that total motor imports into Kenya and Uganda during 1926 were valued at nearly $4,500,000. These include cars, trucks, tires and accessories, and fuel and oil. The value of the 1926 imports was almost twice that of 1924 imports but slightly less than for 1925.

Imports of fuel have nearly trebled during the past three years and in 1926 were 2,500,000 Imp. gal. In Kenya there is now one motor vehicle for every two white adults but the Association still believes the saturation point to be far off.

Total imports of passenger cars were 1403, of which 61 per cent came from the United States, and we contributed the same proportion of the 1135 trucks and tractors entering these two territories during 1926.

Service Era Brings New Maintenance Problems to *Manufacturers*

N.A.C.C. service managers convention discusses parts distribution, shop equipment sales, training methods and repair questions.

By A. F. Denham

THERE are four stages in the development of any industry. Beginning with experimentation, the next step is production. When production capacity exceeds demand, merchandising enters, and finally service becomes a predominating factor. If the opinions of speakers at the Service Managers Forum of the N.A.C.C. held in Cleveland can be taken as a criterion, the automotive industry is now entering on this fourth stage of its development, that of service and selling of service.

In his opening remarks at the Forum, Harry M. Jewett, representing the N.A.C.C. Service Committee, stated that manufacturers appreciate the importance of the new arm of the industry. Until recently servicing of cars by dealers was regarded as an unfortunately necessary adjunct to new car sales. Such service was kept down to a minimum as far as possible and no real attempts were generally made to put service on a profitable basis. In the past few years free service of cars has gradually begun to disappear. However, as Mr. Jewett said, this change of heart on the part of the dealer is not as prevalent as might be wished, although the situation is promising at present.

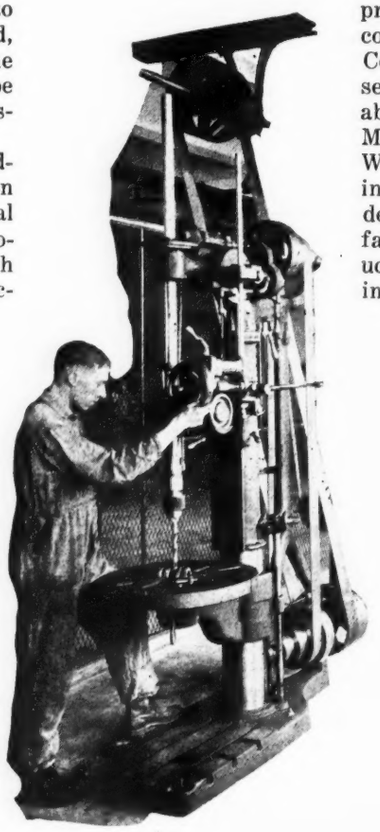
Following up Mr. Jewett's remarks, Edward S. Jordan, President of the Jordan Motor Car Company outlined the general condition of the automotive industry today, analyzing the various steps which have led up to the present situation. According to Mr. Jordan, merchandising efforts, which became the predominating factor in 1925 with production capacity in excess of demand, may be divided into five general classes. Each of these was instrumental at the time of its first introduction in stimulating sales, but with the general adoption of each policy the profit derived therefrom in increasing sales was eliminated. The various methods of stimulating sales were given by Mr. Jordan as:

1. Price cuts
2. Time payments
3. Multiplicity of models
4. Reduction of dealers territory
5. Merchandising the economics of a vehicle.

The final period, according to Mr. Jordan, must depend on the cost per ton mile of operation, original cost of the vehicle and the cost and ease of maintenance. The car which lasts longest, comes to the second-hand market with the highest valuation, and requires a minimum of service, or service at low cost, is the one whose maker will stay in business. At the present time, Mr. Jordan states, the dealer's salesman is not really a salesman but a purchasing agent for the dealer, buying used cars. The service man is the only one left who can sell cars.

In discussing Mr. Jordan's address, H. R. Cobleigh of the N.A.C.C. emphasized that there can be no cure-all for the used car situation. This applies especially to the various used car plans advocated, with the exception of the Windsor Plan, which Mr. Cobleigh claims is not really a plan but a used car market report.

With the increasing importance of service in selling cars and trucks, a closer alliance between factory service departments and engineering and production divisions is necessary according to O. M. Brede of the Yellow Coach and Truck Company who presented a paper on this subject in the absence of Louis Ruthenburg, General Manager, Yellow Sleeve Valve Engine Works. In addition, the necessity of inspecting new cars before delivery by dealers should be emphasized by the factory. A good deal of constructive education of the dealer along lines of selling service can be made by the factory.



The dealer should have the new car or truck buyer meet the service manager of his organization. The service manager should show the buyer his facilities for servicing and explain his shop's policies.

In securing the buyer's confidence and probable future service, Mr. Brede stated, too much importance can not be laid on cleanliness of the dealer's shop. Having the proper shop equipment is also essential while any efforts made along lines of promulgating education of shop mechanics or introduction of wage incentive plans among service stations should prove of considerable profit. Conducting contests among dealer's mechanic for time-saving tools also is useful in developing

new tools which can be more widely broadcast to facilitate servicing. As an example Mr. Brede cited the experience of the Yellow Coach & Truck Company which conducted a contest for designs of time-saving tools among its dealers' service stations. As a result of designs submitted, 103 new tools were found to be actually time-saving, and a great number of these are being incorporated by the factory in suggested shop equipment.

A number of manufacturers are now controlling dealer's parts stocks from the factory. With the introduction of proper stock records such a method, according to Mr. Brede, should be helpful in reducing complaints due to delayed service, while reduced capital investment and increased turnover in parts would be of benefit to the dealer. The general discussion following the paper brought out the fact that a considerable number of manufacturers who have been doing work along these lines allow the dealer to return parts to the factory for credit, deducting 10 per cent for handling; the period during which such parts may be returned ranging from three to six months. Some manufacturers also make a distinction between essential and non-essential parts, the latter being returnable only if called in by the factory to supply another dealer's demand.

More complete and accurate catalogue information to facilitate purchase of parts and servicing of buses, from the fleet operators angle is a requisite at present according to Pierre V. C. See, Superintendent of Equipment, Northern Ohio Power and Light Company, which operates a total of 215 buses in all types of service. Mr. See stated that nearly every type of bus ever manufactured had been used at one time or another by his company. Multigraphed or printed circulars issued by the factory are practically worthless to the fleet operator, according to Mr. See, unless they are properly supported by photographs or drawings that show individual pieces. This condition has often been so bad with his company that they have had to order parts from the catalogue of another company, stating that the piece desired was the same only for their bus. According to Mr. See this catalogue information is far more important than expensive instruction books.

Bus Improvements Suggested

Of the mechanical features of buses which could stand considerable improvement, Mr. See cited brakes, gas tank installations, proper tire sizes, greater standardization of engine installation, and some definite oil specifications. Regarding brakes, Mr. See stated that some buses have insufficient brake cam lift, others have cams which do not exert constant pressure throughout the stroke and after the lining wears; other designs, while giving good brake operation with new lining on an unloaded bus, give unsatisfactory service with a loaded vehicle, especially with the lining worn. Another item cited by Mr. See was that so-called "parking" brakes were of no use in bus operation. What is needed is an efficient and reliable emergency brake, that will be effective in case of failure of service brakes.

Gas tank installations should be of such nature as to permit rapid loading of large quantities and to eliminate loss in transit while going around curves. Bus tires are often found to be much overloaded according to tire association figures stated Mr. See. The practice of some manufacturers of using oversize blocks for buses was also criticized, since this eliminated some of the useful life of an engine by making at least one reboring unavailable to the operator.

Regarding engine installations, Mr. See expressed the hope that in the near future buses can be designed so that the engine may be changed within a couple of hours, while the dream of the bus operator is that some day he may be able to interchange engines of different makes.

One of the greatest services that could be rendered a bus operator, according to Mr. See, would be the drafting of oil specifications that would definitely specify the characteristics of lubricating oils. At the present time no really effective method of test is available. As pointed out in the discussion of Mr. See's paper, this subject was also given consideration at the S.A.E. convention at French Lick Springs last month, but it was agreed at the Service Managers' Forum that such specifications should not be rushed through, but should be given serious consideration and trial before definite recommendations are made.

Pirate Parts Again

The discussion of Mr. See's paper also raised the question of so-called "pirate" parts. Mr. See stated he preferred to obtain the parts from vehicle manufacturers if the right one can be secured, but that in many cases other parts were superior. A. R. Sandt of the General Motors Corporatiton objected to the term "pirate" parts, suggesting that they be called "competitive" parts since they generally are pretty good merchandise and are not really "pirate" parts in the proper sense of the word. If the competitive part is better than that supplied by the vehicle manufacturer, Mr. Sandt stated, there should be no reason why the dealer or service station should not buy it. Naturally this aroused considerable argument as to whether the factory ought to sanction the purchase of competitive parts by dealers or had a right to dictate to the dealer in this matter.

This discussion tied up well with the two following papers, which dealt with the question "How Should Shop Equipment be Distributed?" Martin E. Goldman Manager of the Shop Equipment Division of the Automotive Equipment Association maintaining that such distribution should be through the jobber channel while R. A. Stougaard of the Service Department, Packard Motor Company, maintained that distribution should be by car factory direct.

Advantages claimed for the jobber method of distribution were that

1. Correct tools are more easily obtainable. The actual tool can also be shown as against having to obtain an idea of its characteristics from a factory bulletin or circular.
2. The dealer is enabled to see the actual tool in operation before investing his money.
3. Chance of being forced to enter claims against common carriers for loss or damage in transit is eliminated by direct delivery to the dealer's shop.
4. With factory distribution, instructions for installation and operation are often too technical or not sufficiently clear, as against actual demonstration by the jobber.
5. Dealer is enabled to buy his shop equipment on time payments, whereas with factory distribution he has to pay cash in advance or C.O.D.
6. Tools distributed by jobbers can be serviced quickly in case of damage, eliminating costly waits for new tools from the factory.
7. High transportation cost of heavy equipment is eliminated.

The jobber is in closer touch with the service station. In distributing shop equipment he has assumed the position of a retailer dealing directly with the consumer, whereas the factory distribution method, according to Mr. Goldman, attempts to eliminate the retailer entirely. Moreover, the jobber knows more clearly the service station's specific needs as determined by his location, and has a clearer knowledge of credit standings.

It is the jobber, according to Mr. Goldman, who has been responsible for the adoption by car manufacturers of various items of equipment, starting with headlights, windshields, and down the line through windshield wipers, crowned fenders, linoleum running boards, and at present air cleaners, oil strainers, etc. The same situation applies to shop equipment and the jobber of today is in a better position to sell the dealer or service man on shop equipment than the factory. Another factor claimed in favor of the jobber is that the dealer would much prefer to spend his money locally, where some of it may eventually find its way back into his own till.

BELIEVING that advertising of service is an effective means of bringing to the attention of car owners the need of having their cars properly serviced, service is now nationally advertised by the Chevrolet company, while bulletins are sent to dealers, and mats for local newspaper advertising of service are furnished dealers at nominal sums.

Proper training of dealer shop personnel is carried on through 25 service schools in the field.

Factory distribution of shop equipment, according to Mr. Stougaard, was forced on the manufacturer by his dealers. Its origin was found in the supplying of special tools not available on the open market. Some of these tools were later turned over to tool manufacturers, but changes in design of cars left the tool manufacturer with large stocks. This again forced higher prices on subsequent tools to offset the consequent loss incurred and to provide against a recurrence. In order to obviate this situation the Packard Company now works with a number of tool manufacturers, buying on order only. These tools are handled at no profit to the factory with the exception of a 10 per cent handling and 5 per cent experimental charge handed on to the service station. With the supplying of a few tools, of specialized nature, according to Mr. Stougaard, the dealer began to demand that the factory supply him with other items. Mr. Stougaard admitted that this had been carried too far and that certain items now handled by car factories should properly be handled by jobbers, including in this list such items as drills, files, jacks, washrack equipment, wrecking cranes, etc. In fact at the present time, to meet the demands of dealers the Packard Company is supplying even architectural plans for service shops, and material and plans for decoration.

Mr. Goldman claimed in return that the dealer buys his shop equipment from the factory direct because he is afraid of antagonizing the factory through its road organization.

An interesting system of handling parts shipments from the factory resulting in reduced cost and labor, was described by A. H. Prasse, Parts Service Manager of The White Company. His organization, rather than ship parts to both branches and dealers, ships to branches only, who deal directly with the dealers in their territory. The mechanics of the system consist in the adoption of a triplicate tag fastened together with carbon paper between the tags. The upper two tags are of paper, one white and one yellow, while the bottom tag is of cardboard for attachment directly to the parts in shipment. The branch fills out the tags, keeps the first, which is filed by tag number, and sends the other two to the factory.

On receipt, the tags go to the shipping room where the parts are selected and the tags attached. On packing, the second paper tag is removed and used in making out invoices, etc. In every case handling is entirely by tag number. No orders are held at the factory over three days. At the factory the stockroom is placed on a bonus payment system. Three stockrooms are provided, one for small parts, one for heavy parts and one for bulky parts. In this way the stock filler's efficiency is easy to calculate by the number of tags he fills, the only difference in the stockrooms being as to equipment used and time allotment. While a penalty is imposed on stock fillers for errors, it has been found that such errors are less than one-tenth of one per cent.

An individual bonus system has also been worked out for packers on a like basis, differences in time allowance being made according to the type of packing used. The net effect of the bonus system in the stockroom has been to secure an increased tonnage of shipments with a reduction in help from 77 to 54.

"Training Shop Mechanics and Service Executives" was the title of an interesting and timely paper presented by Prof. John Younger of the Ohio State University. With the increasing importance of service in the automotive industry a better class of mechanics must be obtained and the maintenance mechanic must be raised to the position of specialist in his line, according to Mr. Younger. Discussion of this paper brought out that the Cleveland Trade School which was started at the instigation of automotive men has resulted in turning out a class of mechanics for which the demand considerably exceeds the supply. Regarding maintenance executives, Mr. Younger stated that it was preferable to take a man from the organization proper and train him rather than to take in outsiders.

A belief that one of the most difficult things to overcome when trying to improve service conditions is the lack of interest on the part of the dealers themselves was expressed by Dudley G. Frazer, Service Promotion Manager, Chevrolet Motor Company, in his paper on "Chevrolet's Service Promotion Program." The Chevrolet company has developed a program for improving service conditions in the field. A standard layout of the shop is furnished dealers, whose principal features are an enclosed tool room, adjacent to the repair line, over which an overhead lifting system is installed connecting it to the tool room. A standard line of tools is recommended. Flat rate operation of service shops is required.

Bettering Motor Performance

Motor bearing development has been largely responsible for increases in motor performance, including higher engine speeds, according to D. E. Anderson, Bohn Aluminum and Brass Corp., who presented a paper on "Improvement in Motor Bearing Construction Featuring Interchangeable Bearings." Apart from engineering developments, important advances have been made in facilitating servicing. Originally bearings had to be hand-scraped. Later this method was superseded by line-reaming. Line-reaming of bearings also proved undesirable due to the expense of tools for proper servicing of bearings. As a result interchangeable bearings were developed. Manufacturing limits of these bearings are held, in the major dimensions to a quarter thousandth. Since shims are not used, and the maintenance of proper oil clearances is important, broaching of such bearings should be highly accurate. In servicing bearings in the field, mechanics should be instructed not to file bearings or crankcase since interchange-

ability is ruined by doing so. If a new bearing does not fit the crankshaft, the shaft should be ground undersize, according to Mr. Anderson.

A summary of what the Automotive Electric Association has been doing in the way of special publications to educate dealers to proper service was given by Earl Turner of that association.

Discussions of flat rate permeated the entire meeting. The subject was finally brought to a head by Percy E. Chamberlain of the Automotive Equipment Association in his paper on "What the Flat Rate Has Accomplished." Mr. Chamberlain who advocated the adoption of the flat rate as far back as 1918 stated that while flat rate in itself was now generally accepted, it is not yet properly sold, adding that he had yet to find an organization which is 100 per cent flat rate—the "per hour" charge entirely eliminated. Many who bill the customer according to flat rate do not pay mechanics on a piece work basis.

Flat Rate Benefits

The chief benefits of the flat rate apparent at present are analyzed by Mr. Chamberlain as follows:

1. It has proved that it is possible to maintain automobiles on a scientific, efficient basis.
2. It has made the pay-by-contract method of paying mechanics possible, making possible the final acceptance by the public of the mechanic as a skilled mechanic.
3. It has defeated unionism in the shops, one of the most important features from a factory angle.
4. It has eliminated guess work in reconditioning of used cars.
5. It has reduced shop waste while increasing profit and sales volume.
6. It has eliminated "come-back work" when properly handled, and intelligently sold.

A car service station should have available sufficient data and knowledge to put service on every make of car on a flat rate basis. According to Mr. Chamberlain there is no such thing as an exclusive dealer at present except perhaps in metropolitan districts. The independent garage also cannot be eliminated by legislation. Just so long as flat rate is not sold as a "method" the independent garage will be perpetuated, since the customer goes where it is easiest for him to buy. In addition, a dealer's service station cannot handle all his repair business if it should all come to him. It is a big question, according to Mr. Chamberlain, whether the best end—that of selling cars—is served by failure to consider the independent shop. A reputation of a car is largely influenced by the type of service it gets, whether this service is performed by the dealer or the independent shop.

H. C. Taylor's paper on "Group Bonus Payment of Mechanics" presented a good example of what can be accomplished along that line following the adoption of flat rate. Mr. Taylor, who is connected with the Service Department of the Packard Motor Car Company, outlined the method instituted by Packard among its dealer service stations. According to this system, the mechanics are assured of a base time rate of pay. If the company loses money the mechanics do not suffer. If there is a gain over the time allowance for service work, the profit is shared by the dealer organization and the mechanic. In this manner the service station is enabled to build up an additional revenue to offset losses, while guaranteeing mechanics a minimum pay. For each hour gained by a group of mechanics, this group is paid thirty cents which is shared among the group. These gains are computed every day. In addition each mechanic is paid 10 cents an hour extra for every hour of saving for which he is personally responsible. Through the adoption of this plan a mechanic is willing to accept hard work since he knows that he shares in any time saved by his group. with the other mechanics of his group on easier operations.

The average gain in time effected through the adoption of this system is in the neighborhood of 25 to 30 per cent. $25,000 was paid to mechanics in Chicago last year in the form of bonus money, according to Mr. Taylor.

A general condemnation of the oil pressure gage as a measure of gaging lubrication of an engine was the feature of a paper on "When Lubrication Fails and Why," presented by H. L. Newton of the Manufacturers Service Division, Vacuum Oil Company. Lubrication should properly be judged not by pressure but by volume. In fact the pressure gage often gives exactly the opposite reading of what actual lubrication conditions are. If there is a clogged oil line, pressure goes up, and lubrication down. When the oil is cold and viscous, pressure is high, but little oil is passing through the engine bearings or being thrown on cylinder walls. Pressure in itself then does not insure adequate lubrication.

The situation is especially true since engine speeds have been increased. In pressure lubrication engines, there is a groove in the main bearing shell which registers with a drilled passage in the crankshaft. Inertia of oil here plays a large factor. The shorter the groove the greater oil pressure is needed to overcome this inertia, the pressure needed being governed by the length of the groove and speed of the engine. With a 2⅜ in. diameter shaft rotating at 3000 r.p.m., and having oil grooves 1¼ in. long, oil flow has to stop and start fifty times a second.

THE average automobile owner, according to Percy Chamberlain of the Automotive Equipment Association, knows little about flat rate. In endeavoring to sell the public on the idea of flat rate it is necessary for factory service divisions to take a hand.

The entire "per hour" hour must be eliminated. In the past customers have been educated to pay so much per hour, and this will have to be overcome. While the owner does and should pay for the overhead in the shop, idle time and non-productive time, he should not realize he is paying for this.

Some manufacturers are at present using a throttle controlled pressure to increase pressure with load. However changes in viscosity can easily upset the relationship between this control and the spring pressure on the by-pass. Mr. Newton stated that the short groove was originally introduced to overcome oil pumping troubles, but that its introduction has been accompanied by worse troubles. He recommended that an oil pressure of from five to ten pounds be used, and experiment then with the length of groove necessary to obtain correct oil flow.

While it would seem that an unusual percentage of the discussion and papers at the Service Managers' Forum was devoted to the dealer's problems, this indicates a healthy sign. Service is becoming more and more important and proper education of the dealer in selling may become shortly one of the primary influences determining a vehicle manufacturer's standing.

In *the* Realm *of* Metallurgy—

New tool steel having deep hardening properties when hardened in oil is a recent development.

A NEW tool steel known as H. Y. C. C. steel has been placed on the market by the Crucible Steel Company of America and is fully described in a booklet recently issued by that concern. It is an alloy steel possessing deep hardening properties when hardened in oil, while in moderate sections it will harden in air, and the distortion is claimed to be a minimum whether oil-hardening or air-hardening is used. After hardening the temper may be drawn over a much wider range of temperatures than permissible with carbon tool steel, thereby effectively relieving hardening strains and putting the tool in the best condition. The manufacturers say they consider the steel a very safe one to handle and if instructions are followed hardening losses will be practically eliminated.

H. Y. C. C. steel can be used for broaches, burnishing tools, bushings, slitting cutters, plug and ring gages, knurling tools, lathe centers, mandrels, press tools, punches, reamers, sand blast nozzles, spinning tools, swedges, taps, turning tools and all kinds of dies and rolls.

Care Required in Forging

Having a high carbon and alloy content, H. Y. C. C. steel must be handled with considerable care in forging. Heating is begun in a low fire and the temperature is gradually brought up to about 2,000 deg. F., the limit being 2,050 deg. The steel should not be forged after its temperature has dropped to 1,650 deg. F., and if the forging cannot be completed in a single heating it should be reheated and the cycle repeated. Too much reduction at a single blow should not be attempted, and the work should be maintained at heat long enough to ensure the temperature will be substantially uniform throughout the mass.

To relieve forging strains it is recommended that the work be normalized after it has been forged and before it has become entirely cold. Normalizing is accomplished by heating to between 1,750 and 1,800 deg. F. and cooling in a dry place in still air.

After normalizing, the steel should be annealed for machining. It is advisable to pack the steel in some inert substance encased in pipes or boxes. The work is heated to between 1,450 and 1,500 deg. F. and is held at this temperature for between two and four hours, after which it is allowed to cool slowly in the furnace. When properly annealed H. Y. C. C. steel should show about 228 Brinell, the limit being 241 Brinell.

For hardening, the steel is heated slowly and uniformly to a temperature between 1,700 and 1,825 deg. F., depending upon the size and character of the work being hardened. The higher temperature is used when it is desired to develop maximum hardness. These temperatures are considerably higher than those used in hardening ordinary tool steel, the character of the alloy being such that the reactions on heating are not as rapid as with carbon steel. It is necessary to take precautions to avoid surface decarbonization, particularly in pieces that cannot be ground after hardening.

Preheating to a temperature between 1,300 and 1,400 deg. F. is recommended, after which the steel is brought up to the hardening temperature. The steel may be heated in open furnaces if care is used to maintain an atmosphere that is not decarbonizing. It is preferable, however, to pack-harden, that is, to protect the steel in some material which will prevent decarbonization. The work should be held at temperature until penetration is complete and the whole mass is substantially uniform in temperature throughout. It is said that this time is considerably longer, than that necessary to harden carbon tool steel. Quenching is done in oil.

Immediately after quenching and preferably before the hardened tool has become cold it should be tempered. The degree of temper will depend on the service expected of the tool. The chart reproduced herewith shows approximately the degree of hardness which may be expected of the steel after tempering at various temperatures. The results are improved if the work is held at the tempering temperature for a considerable period of time, that is, about two hours. It should be borne in mind that the initial hardness may vary somewhat, depending on the quenching temperature used, the size of the piece and the time it is held at heat before quenching. The hardness after tempering may also vary somewhat from the curve shown, depending on the initial hardness resulting from the quenching.

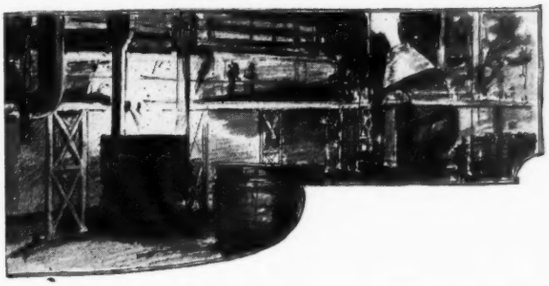
Tin Supply is Dwindling

TIN is one of the materials employed in the engineering industries for which it has been impossible to find a substitute. During recent years there has been a slowing up in production and a simultaneous increase in demand, with resultant hardening of prices.

More than 60 per cent of the tin produced in the world comes from the Malay States. Bolivia furnishes 21 per cent. Most of the production of the Far East is from secondary alluvious deposits which, if the present rate of production is maintained, will be exhausted in about 12 years.

During 1925 the world's production of tin amounted to approximately 140,000 tons as compared with 122.-

New Processes *and* Materials



Investigation is under way in England to discover what commercial uses can be made of beryllium

000 tons in 1922, 125,000 in 1923 and 132,000 in 1924. Although these figures indicate a moderate of increase in production, consumption is also on the increase, and statistics have been compiled tending to show that at the present time consumption exceeds production by 10,000 tons per year.

Among the consuming countries the United States takes first rank, having taken 48 per cent of the total production in 1924 and 57 per cent in 1925. The United States takes the greater part of the Bolivian production, about 30,500 tons. Great Britain is the next best market for tin, but during the last half of 1926 the coal strike reduced its consumption by about 50 per cent.

The Use of Beryllium

SINCE many technical uses have been found for the two commercial light metals, aluminum and magnesium, some thought has been given recently to possible industrial applications of the two still lighter metals, beryllium and lithium.

Lithium, the third of the chemical elements in the order of atomic weights—the first two are the gases hydrogen and helium—has an atomic weight of 7 and is lighter than water, its specific gravity being only 0.59. It does not seem to have much chance of practical use in the metallic state, on account of its chemical instability, burning freely in the atmosphere when ignited and reacting with water at ordinary temperatures, and also because it melts at 356 deg. Fahr., which is below the temperature attained by the heads of engine pistons; but beryllium may possibly become a metal useful in the engineering industries, and has received a good deal of attention of late. It is the fourth element on the atomic weight scale, having an atomic weight of 9.1. In respect to atomic weight it is thus far below magnesium (24.32) and aluminum (27.1) but on the basis of specific gravity the comparison is not so favorable, for beryllium has a specific gravity of 1.84.

Before beryllium can be thought of seriously for industrial applications its metallurgy will have to be further developed, and some work along this line has been done recently. The metal was first isolated by Woehler a century ago, but its preparation still entails great difficulties and metallic beryllium is quite a rarity. The National Physical Laboratory of Great Britain is making a study of the properties of pure metals of all kinds, and this research also covers beryllium. Owing to its nearness in the atomic scale to magnesium and aluminum, beryllium was formerly regarded as a soft and ductile metal, and when the purified thorium, zirconium and titanium were found to be much less brittle than impure specimens, the brittleness of beryllium was ascribed to minor impurities. The investigations at the National Physical Laboratory, which were dealt with in a paper by A. C. Vivian before the Faraday Society recently, indicate that the brittleness is due particularly to the presence of oxide and nitrite.

The ordinary beryllium mineral, which is found in moderate quantities, is beryl, the double silicate of aluminum and beryllium; it contains about 5 per cent of the latter. A satisfactory method of attacking beryl by means of sodium silcofluoride was described by Copaux in 1919. The richer beryllium minerals such as the simple silicate (phenakite), the emerald and other gems, are rarer. It has been claimed that the metal can be reduced by means of magnesium. The difficulties of its electrolytic separation from fused salts, which had been effected by Liebmann, Lebeau (Moissan's assistant), and Stock and Goldschmidt, lie in the properties of the metal. The salt bath should be a conductor of electricity, and not volatilize too easily at temperatures at which the reduced particles of the metal can fuse together. Beryllium melts at about 1300 deg. C.; boiling points of the alkali halides, especially the chlorides and bromides, largely used as solvents, are much lower than this. The fluorides are less volatile; but the beryllium fluoride is hygroscopic, and this fact gives rise to trouble in fused electrolysis, it is almost a non-conductor. The double fluorides are more suitable and not deliquescent. Mr. Vivian uses the double fluoride BeF_2 NaF, and adds some barium fluoride BaF_2 to raise both the melting and boiling points and the density of the bath in which the reduced beryllium is to float. The method which he employs is that by which Borchers first electrolyzed fused calcium chloride; the cathode just dips into the bath, and is gradually raised as the metal deposits on it. The metal is thus obtained in the form of a stick.

Case-Hardened Crankshafts

THAT case-hardened surfaces are much harder than oil-hardened surfaces and therefore much more resistant to wear is well known. The differences in the hardness numbers finish a good index to the difference in the wearing qualities. Experience data relating to the superior wearing qualities of case-

hardened as compared with oil-hardened crankshafts have now been given out by the H. H. Franklin Mfg. Co. which has used case-hardened crankshafts since 1921. Since 1920, 1434 crankshafts of the oil-hardened type were sent to the factory for regrinding, while since 1921 only 13 case-hardened shafts were received for the same purpose, and all of these during the last three years, there having been not a single case of regrinding during the first four years that the case-hardened crankshafts were in use.

Terminology of Heat Treatment

EFFORTS are being made by the American Society for Testing Materials to standardize the terms used in connection with the heat treatment of ferrous materials, and tentative standard terms and definitions have been drawn up, on which criticism is asked from competent sources. In preparing the definitions submitted, the terms have been so defined (as most in keeping with present-day usage) that they shall mean definite operations and shall not be considered as referring to the resultant structures or general conditions. By "critical temperature range," as used in the definitions, is meant the temperature range illustrated by the following Fig. 1, taken from Howe:

Following is a list of the proposed terms and definitions:

Heat Treatment.—An operation or combination of operations involving the heating or cooling of a metal or an alloy in the solid state.

NOTE.—This is for the purpose of obtaining certain desirable conditions or properties. Heating or cooling for the sole purpose of mechanical working are excluded from the meaning of this definition.

Quenching.—Immersing to cool.

NOTE.—Immersion may be in liquids, gases or solids.

Hardening.—Heating and quenching certain iron-base alloys from a temperature either within or above the critical temperature range.

Annealing.—Annealing is a heating and cooling operation of a material in the solid state.

NOTE 1.—Annealing usually implies a relatively slow cooling.

NOTE 2.—Annealing is a comprehensive term. The purpose of such a heat treatment may be:

(*a*) To remove stresses
(*b*) To induce softness
(*c*) To alter ductility, toughness, electrical, magnetic or other physical properties

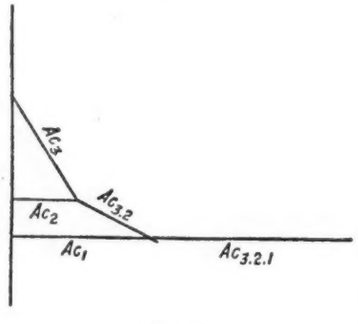


FIG. 1.

(*d*) To refine the crystalline structure
(*e*) To remove gases

In annealing, the temperature of the operation and the rate of cooling depend upon the material being heat treated and the *purpose* of the treatment.

Certain specific heat treatments coming under the comprehensive term "annealing" are:

Normalizing.—Heating iron-base alloys above the critical temperature range followed by cooling to below that range in still air at ordinary temperature.

NOTE.—In the case of hyper-eutectoid steel, it is often desirable to heat above the Ac_{cm} line, as shown in Fig. 2.

Spheroidizing.—Prolonged heating of iron-base alloys at a temperature in the neighborhood of, but generally

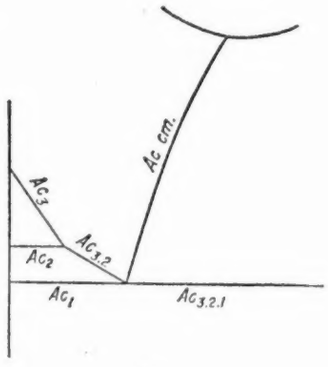


FIG. 2.

slightly below, the critical temperature range, usually followed by relatively slow cooling.

NOTE 1.—In the case of small objects of high-carbon steels, the spheroidizing result is achieved more rapidly by prolonged heating to temperatures alternately within and slightly below the critical temperature range.

NOTE 2.—The object of this heat treatment is to produce a globular condition of the carbide.

Tempering (also termed Drawing).—Reheating after hardening, to some temperature below the critical temperature range followed by any rate of cooling.

NOTE 1.—Although the terms "tempering" and "drawing" are practically synonymous as used in commercial practice, the term "tempering" is preferred.

NOTE 2.—Tempering meaning the operation of hardening followed by reheating is a usage which is illogical and confusing in the present state of the art of heat treating and should be discouraged.

Malleablizing.—Malleablizing is a type of annealing operation with slow cooling whereby combined carbon in white cast iron is transformed to temper carbon and in some cases the carbon is entirely removed from the iron.

NOTE.—Temper carbon is free carbon in the form of rounded nodules made up of an aggregate of minute crystals.

Graphitizing.—Graphitizing is a type of annealing of cast iron whereby some or all of the combined carbon is transformed to free or uncombined carbon.

Carburizing (Cementation).—Adding carbon to iron-base alloys by heating the metal below its melting point in contact with carbonaceous material.

NOTE.—The term "carbonizing" used in this sense is undesirable and its use should be discouraged.

Case Hardening.—Carburizing and subsequently hardening by suitable heat treatment, all or part of the surface portions of a piece of iron-base alloy.

Case.—That portion of a carburized iron-base alloy article in which the carbon content has been substantially increased.

Core.—That portion of a carburized iron-base alloy article in which the carbon content has not been substantially increased.

NOTE.—The terms "case" and "core" apply both to carburizing and case-hardening.

Cyaniding.—Surface hardening of an iron-base alloy article or portion of it by heating at a suitable temperature in contact with a cyanide salt.

Any criticisms of the above proposed standard terms and definitions should be addressed to J. H. Hall, High Bridge, N. J.

Effect of Volatility on Engine Performance Studied

Eight fuels of different volatility characteristics are used in tests at University of Michigan to determine which is best for starting, acceleration, power, etc.

A STUDY of the relation of motor fuel characteristics to engine performance has been made at the University of Michigan, Department of Engineering Research, and its results are embodied in a recent publication, Engineering Research Bulletin No. 7, of which George Granger Brown is the author. Efforts were made to determine the effective volatility of various fuels from the viewpoints of starting, acceleration, maximum power, and fuel consumption.

The detrimental effects of low volatility are in general well known, and in order that low volatility fuels might be more satisfactorily used in automobile engines, manufacturers have introduced the heated inlet manifold and the ventilated crankcase. Two points in connection with volatility have not been made entirely clear, however, Mr. Brown says, namely, what kind of volatility and what degree of volatility are desirable to secure the most satisfactory engine performance?

Two Distinct Methods

There are two distinct methods of securing volatility in motor fuels; it may be secured:

1. By limiting the amount of material contained in ordinary gasoline which is vaporized only at higher temperatures.

2. By including a sufficient quantity of material that is easily vaporized at low temperatures, in order to insure adequate volatility even when considerable amounts of "heavy ends" are also included.

The results obtained from these two methods are quite different and make necessary the recognition of at least two different types of fuel volatility. The first method increases the volatility at high temperatures, while the second increases it at low temperatures. The two types of volatility are quite different. The first is characterized by complete volatility at relatively low temperatures, although it may be accompanied by very limited partial volatility at still lower temperatures. The second is characterized by a high partial volatility at low temperatures, although it may be accompanied by complete volatility only at relatively high temperatures. This important distinction has not been generally recognized.

The author holds that the ordinary distillation curve obtained by means of an Engler apparatus (the A. S. T. M. distillation) is difficult to interpret in terms of engine performance. In a carburetor the fuel is vaporized in a current of air and in contact with its own vapor, while in the Engler flask it is vaporized in the absence of air and with its own vapor removed as formed. "Clearly, the experimental conditions are so unlike those encountered in the actual performance of an engine as to make the use of data obtained experimentally difficult to apply in practice."

Tests were therefore made with eight fuels of different volatility characteristics to determine the number of revolutions required to start the engines at various outside temperatures. The results are given in tabular form and the conclusion is drawn from them that for ease of starting, high partial volatility at low temperatures is absolutely necessary and can be obtained only by having present in the fuel appreciably large quantities of those compounds vaporizing at low temperatures. Elimination from the fuel of those compounds vaporizing at high temperatures increases the complete volatility but has no practical advantage so far as ease of starting is concerned. The effective volatility for starting is low temperature partial volatility as indicated by low initial and 10 per cent points on the distillation curve.

In a similar way the effect of volatility on acceleration was studied experimentally. This series of tests included the determination of the minimum revolutions per minute at which the throttle could be suddenly opened without causing back-firing, and the time taken to accelerate the engines from one pre-determined speed to another with each of the different fuels. As these tests depend more on the carburetor and engine characteristics than did the starting tests, it is impossible to average the results obtained, as was done in the starting tests. The following conclusion are drawn from the acceleration tests:

1. The end point on the A. S. T. M. distillation has a noticeable effect on acceleration. Although a low-end point may tend to shorten the warming-up period, it also tends to cause loss of power and poor acceleration after the engine is thoroughly warmed up, particularly if the intake manifold is supplied with a large amount of exhaust heat.

The Warming-up Period

2. The ease of keeping a motor running during the warming-up period depends somewhat upon the same characteristics of fuel volatility as determine the case of starting; the difference lies in the fact that the engine manifold and carburetor are not at any constant temperature, but are warming up, and the fuel-air ratio is less, particularly if the choke is used for starting. This means that a greater percentage of the fuel must be vaporized to form an explosive mixture after the engine has been started. Although 5 per cent of the fuel vaporized under starting conditions will enable the motor to be started without serious difficulty, at least 30 to 40 per cent of the fuel must be vaporized to obtain

reasonable performance under driving conditions.

3. A wide range in composition, represented by a low initial and fairly straight distillation curve to a moderately high end point, is highly desirable to give the best general performance over a wide range in temperatures, such as exist in all motors having effectively heated intake manifolds.

In determining the effects of varying degrees of volatility on the maximum power obtainable from the engines, and on the fuel consumption, the carburetor and ignition were set for best performance with a test fuel representative of U. S. Motor gasoline, widely sold in the North Central States. The results of the tests for maximum power indicate that in engines operating at full or one-half load, with the full heat of the exhaust on the intake manifold, there is no noticeable difference in performance, maximum power and fuel consumption, where fuel sold as U. S. Motor (ordinary) gasoline is used, or any of the more volatile fuels with reasonably high end points. This is true under summer conditions (atmospheric temperature 80 deg. Fahr.). Fuels with end points below 425 deg. Fahr. and a high degree of volatility may cause some loss in performance and maximum power in engines with highly heated manifolds or carburetors. But, provided the end point is reasonably high, this loss is slight.

A test made with all adjustments the same as in the previous case but with no exhaust heat to the manifold showed a noticeable decrease in maximum power due to the heating of the inlet manifold. With one engine, which had no provision for exhaust-heating the inlet manifold, a slight but noticeable increase in power was observed when using the more volatile fuels.

Actual Airplane Tests

An opportunity to verify these conclusions regarding the importance of high volatility particularly at low temperatures in relation to maximum power in actual airplane tests was first offered on Dec. 9, 1926, at McIntyre Air Port, Tulsa, Okla. The tests were made on a popular two-passenger biplane equipped with 90 hp. engine and piloted by Mr. McIntyre. In these tests the plane was started on the ground and note was taken of the time and length of run required for the take-off, the climb possible in one minute, and the maximum speed as the average between the speeds north and south between stations two miles apart.

With an airplane, a slight increase in the engine maximum r.p.m. enables the pilot to take off in less distance and to climb at a steeper angle, both of which qualities are of great importance when it is necessary to take off from a field of limited dimensions. In general, the peculiar conditions of airplane operation call for more volatile fuel for maximum power than is required for maximum power in motor cars. In aircraft engines high partial volatility at low temperatures is more important than high complete volatility, as represented by low end points.

The fuel consumption by weight decreases in all cases with increasing volatility, within definite limits. In the case of an unheated manifold, fuel consumption by weight decreases with increasing volatility without limit. In some cases a 20 per cent reduction was observed. In the case of an engine with cold manifold the fuel consumption proved to be very high with two rather low grade fuels when running at 1000 r.p.m. at half load. This was found to be due to a "blind spot" in the carburetor performance curve, the mixture supplied at this speed being so lean that it was impossible to distribute it properly to the six cylinders. With a heated manifold or with a more volatile fuel the economy under otherwise the same conditions was good. On the whole, the differences in fuel consumption shown by the tests are so slight that it may be concluded there is no noticeable gain in fuel economy or in power output under conditions of steady driving when using highly volatile fuels in modern motor cars equipped with intake manifolds heated by exhaust gases.

The author also deals with laboratory tests for determining volatility and says the Engler flask or A. S. T. M. method of distillation does not adequately represent the type of evaporation which occurs in the carburetor and intake manifold of internal combustion engines, particularly when the engines are running under ordinary conditions. Stevenson and Stark have suggested the equilibrium vaporization of gasoline in the absence of air in which the vapor formed by the distillation remains in contact with the liquid until the latter is completely vaporized. In order to place a numerical value on this volatility, they have suggested for a criterion the temperature at which all of the fuel is in the vapor state. This temperature they call the Deppe end point.

Deppe Point Misleading

Apparatus for making similar equilibrium distillations has been described recently by Leslie and Good (*Industrial and Engineering Chemistry*, April, 1927). This method of distillation gives curves which approach much more closely to straight inclined lines than the conventional fuel distillation curves. Mr. Brown observes that the Deppe point, although probably a satisfactory indication of the ease of obtaining a dry, superheated mixture, is positively misleading as a criterion of engine performance. If any single point in the equilibrium or flash vaporization without air is to be used as a criterion of engine performance, it should be the initial rather than the end point. It seems, in fact, very difficult to interpret the data obtained by equilibrium vaporization unless conditions as they exist in a carburetor are more closely represented. Laboratory tests to determine the volatility of fuel should involve vaporization of the fuel in contact with air and its own vapor.

Mr. Brown states that careful consideration of various laboratory methods for measuring volatility indicates that the "equilibrium-air distillation" described by T. S. Sligh in an S. A. E. paper last summer correctly measures volatility, and the method has been found most satisfactory in practice. It consists in vaporizing a definite amount of fuel in the presence of a predetermined volume of air, as, for example, 12 parts of air to 1 of fuel, and should approximate conditions in the engine manifold more closely than any other yet described.

Modification of Sligh Apparatus

At the University of Michigan a modification of the Sligh apparatus was used, and this is described and illustrated in the bulletin. Equilibrium tests made with the different fuels in this apparatus gave results in agreement with the acceleration tests on the same fuels, and seem to justify this method of interpreting the results of equilibrium air distillation. In the tests under consideration, assuming that the temperature in the manifold is 30 deg. below room temperature and that the actual conditions are equivalent to equilibrium at 50 deg. Fahr. below the actual temperature, the fuels should be compared under equilibrium conditions at a temperature of about 0 deg. Fahr., as corresponding to actual conditions in the unheated manifold when air is supplied at 80 deg. Fahr.

Making a comparison of the equilibrium air vaporization for 30, 40 and 60 per cent vaporized and the A. S. T. M. distillation temperatures, it is found that the former can be expressed in terms of the latter as follows: Between the limits of 30 and 60 per cent vaporized, the equilibrium air temperature with an air fuel ratio of 12 is indicated by the equation

$$E.A.T. = \tfrac{3}{4} \ (A.S.T.M. - 200)$$

This equation enables one to compute the equilibrium air temperature between these limits from the A. S. T. M. temperature with an accuracy of better than 10 deg. Fahr. By the help of this relationship the A. S. T. M. distillation can be interpreted readily into terms of true volatility.

The lowest temperature at which all of the fuel is vaporized when mixed with specified amounts of air is called the dewpoint. Various methods of estimating the dewpoint from the data of the A. S. T. M. distillation have been proposed. The simplest is that of Wilson and Barnard, who have suggested that the dewpoint of a 12 to 1 air-fuel mixture can be estimated within 10 deg. Fahr. by subtracting 243 deg. Fahr. from the temperature of the 85 per cent point on the A. S. T. M. distillation. Mr. Brown observes that although this method is satisfactory for fuels of fairly high end point, it misses the mark by 30 deg. and more when applied to low end point fuel.

Data from 26 different fuels were used to find what relation exists between the A. S. T. M. 85 per cent point and the dewpoint as determined by the equilibrium air distillation with an air-fuel ratio of 12, the two sets of values being plotted against each other. Similar plots were made between the 90 per cent and 95 per cent A. S. T. M. points on the one hand and the equilibrium air distillation points on the other, and it was found that the closest agreement is obtained (that is, all of the points obtained lie closest to a line) in the case of the 90 per cent points corrected for loss and residue. Unless this simple correction is made an appreciable error is introduced. The following equation can then be used for estimating the dewpoint from the A. S. T. M. 90 per cent point with an accuracy of about ± 6 deg. Fahr., except in extreme cases:

Dewpoint (12 to 1 air-fuel ratio) = (5/7) (A.S.T.M. 90 per cent in deg. F. — 186)

The author also discusses vapor pressure and says it must not be confused with volatility. The tendency to form vapor is measured in terms of vapor pressure. If a large amount of vapor is allowed to form in the vapor pressure apparatus, the liquid will not have the same composition and vapor pressure as the original fuel. This calls for precautions.

Comparison Shows Difference

A comparison will best serve to make clear the difference between vapor pressure and volatility. Normal octane exerts a vapor pressure of one atmosphere at 257 deg. Fahr. and is 100 per cent volatile at this temperature. If distilled in an A. S. T. M. flask, U. S. Motor gasoline exerts a vapor pressure of one atmosphere at about 125 deg. Fahr., indicating that this fuel will form a small amount of vapor at 125 deg. Fahr. as readily as octane will form vapor at 257 deg. Fahr. But when placed in an A. S. T. M. flask not more than 3 per cent of the motor gasoline is vaporized at 125 deg. and only 38 per cent is vaporized at 257 deg. Fahr.

When the volatility of octane as determined in the equilibrium air distillation with an air-fuel ratio of 12 is compared with that of motor gasoline, it is seen that at all temperatures below 44 deg. Fahr. Motor gasoline has a greater volatility than octane. But at temperatures above 44 deg. Fahr. octane possesses a greater volatility than motor gasoline although the vapor pressure of octane is almost negligible compared to that of motor gasoline. Under these conditions octane is 100 per cent volatile at all temperatures above 80 deg. Fahr. although it exerts a vapor pressure of only 14 mm. of mercury at this temperature, yet motor gasoline is only 60 per cent volatile at 80 deg. Fahr. although it exerts a vapor pressure of 360 mm.

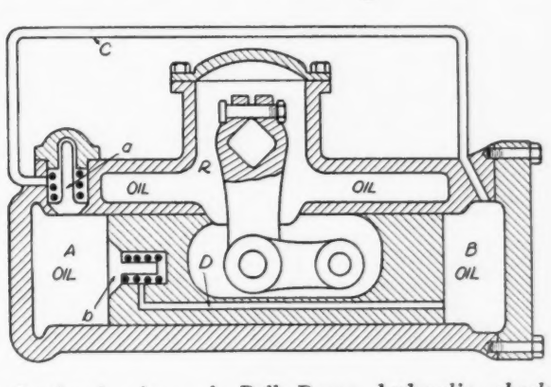
Rolls-Royce Adopts New Shock Damper

FOR the front axles of the British Rolls-Royce cars (20 hp. and 40-50 hp. models) an exclusive design of hydraulic shock absorber has been adopted. The general principle is illustrated in the diagram reproduced herewith.

A is the high-pressure side of the piston; when the latter moves towards *A*—in other words, when the axle moves away from the frame and the road spring rebounds—oil is forced out through the high-pressure valve *a*, and, via the passage *C*, to the low-pressure side, *B*, of the piston. Passage *C* is shown as an external pipe for the sake of clearness; actually it is contained in the casting.

When the axle moves towards the frame, the piston moves to the low-pressure side *B*, and the oil, being unable to pass the high-pressure valve *a* which is non-return, flows through the low-pressure passage *D* in the piston and past the low-pressure valve *b*, thus again force-filling the high-pressure side of the piston. A number of refinements are incorporated in the design which are not shown in the diagram, among them being a means of replenishing both sides of the piston from the reservoir *R;* a means of ejecting any air which may get behind the piston and cause lost movement, and a filter to clean the oil before it enters the high or low-pressure chamber.

On the 40-50 hp. model, Hartford shock absorbers are retained for the rear axle, while at the rear of the 20 hp. chassis the Rolls-Royce friction dampers are being continued.



Sectional view of Rolls-Royce hydraulic shock absorber

The tire equipment has been varied recently. The larger chassis can now have Dunlop 6.75 in. drop channel low-pressure tires as a purchaser's option, in place of the straight-side type; on the 20 hp. model Dunlop 5.25 in. low-pressure tires have been adopted as standard equipment.

Studebaker in Truck Field With ¾-Ton Delivery Units

First time company has engaged in truck manufacture. Chassis has 113-in. wheelbase and four-wheel brakes. Engine is six-cylinder L-head type with 27.3 hp. rating.

STUDEBAKER CORP. OF AMERICA is entering the truck field for the first time with two ¾-ton delivery units which have just been placed on the market. These units are mounted on a 113-in. wheelbase chassis, are powered by a six-cylinder Studebaker engine and are equipped with four-wheel brakes. One is an express and the other a panel body type, each listing at $1,195, f.o.b. factory.

The 3⅜ x 4½ in. L-head engine is mounted in unit with a single plate clutch and a three-speed transmission with reverse. It develops its full horsepower at 2200 r.p.m. and has an S. A. E. rating of 27.3 hp. Connecting rods are forged steel and bearings cast babbitt. The crankshaft, supported by four bronze-backed bearings, is drop forged from steel and machined on all surfaces. Cams and bearings of the four-bearing camshaft are forged integrally. The valves are operated by a roller type of bell crank.

Combined in a compact unit, the oil pump, water pump, generator, relay coil and distributor, are mounted on a single base at the right side of the engine. Force feed lubrication to all the bearings is supplied by a gear driven pump. Pressure is indicated by a gage mounted on the instrument board.

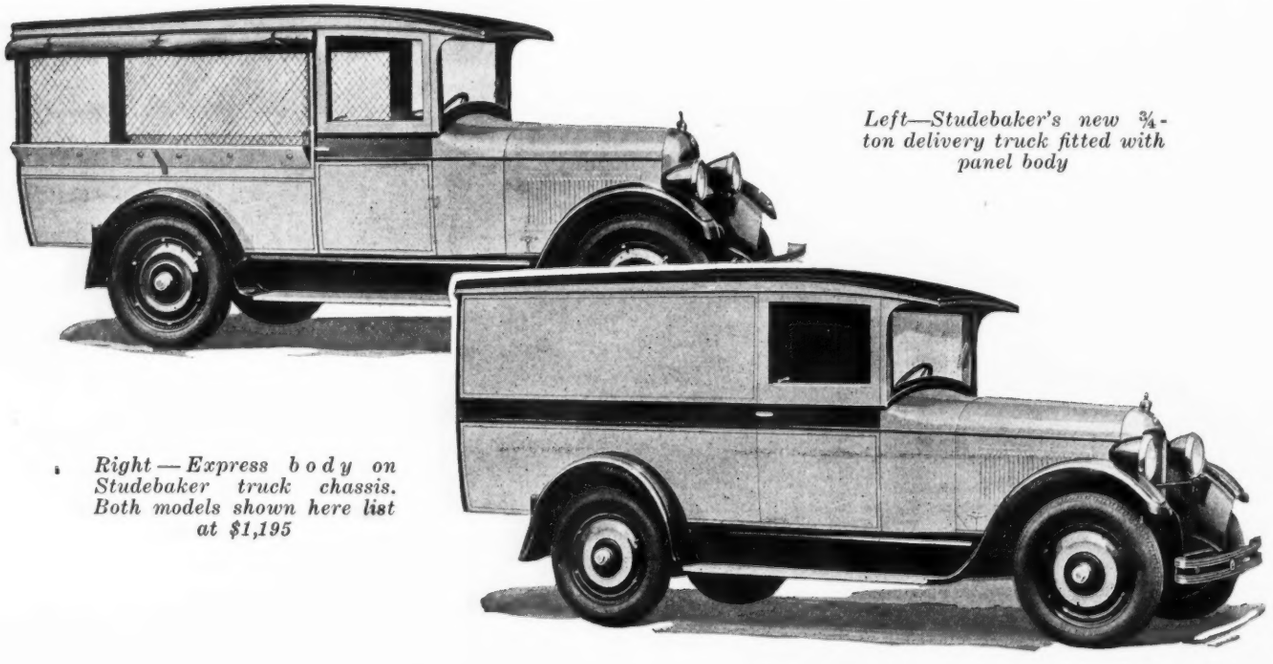
Chassis lubrication is by high pressure.

A 1-in. specially designed plain carburetor fed by vacuum from a 14-gal. tank is used. The intake manifold, with hot spot, is doubly divided to assure uniform mixture in each cylinder. Current for ignition is supplied by generator and battery. The cooling system includes a centrifugal pump, tubular type radiator and 17-in. fan. The starting switch is conveniently located on the toe-board.

Power is carried back from the transmission by a 1¾-in. tubular propeller shaft equipped with two universals to a semi-floating, spiral gear type rear axle of Studebaker design. Load is carried on taper roller bearings at wheel hubs and differential. Drive is Hotchkiss, the torque being taken through large semi-elliptic springs. The rear ends of both front and rear springs are carried on steel links. All spring eyes are bronze bushed.

The four-wheel brakes are of the mechanical type, internals on the front wheel expanding on 14-5/8 x 2 in. drums and externals on the rear contracting on 14-5/16 x 2¼ in. drums. A propeller shaft parking brake is also provided. The steering gear is of the worm and worm wheel type specially designed for the 33 x 6 in. balloon tires used on this model. Reinforced by six cross members, the pressed steel frame is narrow at the front to allow a short turning radius. The side members are 6 in. deep with 1⅞ in. flange. Wheels are steel disk.

Standard equipment includes automatic windshield,



Left—Studebaker's new ¾-ton delivery truck fitted with panel body

Right — Express body on Studebaker truck chassis. Both models shown here list at $1,195

rear-vision mirror, speedometer, hydrostatic gasoline gage, engine heat indicator, oil pressure gage, ammeter and front bumper.

The panel body is designed with a taper roof line to give greater height at a point just back of the driver. Narrow wheel housings give extra body width. The inside dimensions are: Length from driver's seat to rear doors, 77 in.; width, 54 in.; headroom, 51½ in.; and cubic feet of loading space, 123.9. The floor level is 30 in. above the ground. It is constructed of hardwood, ironed and bolted for strength. The sheet steel panels protected by 2½-in. slats on the inside, are turned at the top to give an unbroken surface. The rear door opening is 49 in. wide and 44¾ in. high. Both doors are fitted with windows.

The express body has the same inside dimensions as the panel body, but a drop-end tail-gate which fits flush with the body sides may be carried and the removable side screens give much added room for packing. The 14-in steel covered side panels are topped with 8 in. flare boards. Screen trays may be used for fragile packages. The roof is covered with coach deck material, protected by insulated slats. Celluloid fitted roll curtains are provided.

In both bodies entrance to the driver's seat is afforded from both sides. Seats are comfortably tilted, well padded and covered with leather fabric. Both are finished in rich lacquers with contrasting belts and pin stripings. Several color combinations are available.

Time Payment Sales Developing in Germany

THE development of automobile financing in Germany is dealt with in the annual report of the German Automobile Dealers Association, presented by General Manager Johannes Buschmann at the annual meeting of the Association held on May 25.

The first automobile financing corporations were organized in Germany during the Spring of 1925. The uncertainty in the evaluation of the risks may have been the reason why at that time rates were demanded which discouraged utilization of the credits offered. In the meantime calculations have been revised, and by the end of 1926 the rates had become fairly reasonable. They are substantially the same for all companies.

Early in 1926 negotiations were inaugurated between the Automobile Manufacturers Association and the large banks looking toward the establishment of a central financing institution. As a result of the hesitancy of the banks these did not lead to any definite results. Now, that the credit facilities for automobile purchases are sufficient and the terms offered are acceptable, the plan referred to can be regarded as abandoned.

The Dealers Association reached an agreement with the Credit Institute for Means of Transport concerning credits on purchases by the automobile trade, which at that time were obtainable only with difficulty. The agreement then made has been generally recognized as advantageous. In order to finance the purchase of agricultural motor equipment, the Finance Corporation for Agricultural Motors, Ltd., was formed with a capital of 2,000,000 marks, which offers credits under very favorable terms.

On the whole it seems that the supply of money available for automobile financing in 1926 considerably exceeded the credit demands, and for this reason many of the financing corporations were compelled to extend their operations to other fields such as machinery, pianos, furniture, etc. One reason for this development, aside from the stagnation in the automobile business during the first half of the year, was that the Reichsbank and private banks showed themselves much friendlier toward the automobile business than was the case during the previous year. A large number of members of the Association reported that they had had no difficulties in getting customers' notes cashed by their regular banks, and that for this reason they had had no occasion to do business with special financing institutions. On the other hand, automobile manufacturing concerns, both domestic and foreign, either through their own banking departments or through connections with insurance companies, offered time payment credits, and mostly at rates that were more favorable than those obtainable in the open market.

It is difficult to estimate the volume of time payment transactions as compared with the cash business, but it seems to be increasing. A large number of members of the Association report that 50 to 75 per cent of their motor vehicle business is done on a time-payment basis.

Experiences with the time payment plan have been quite favorable, the losses not exceeding 2-2½ per cent. It seems that respect for the clause by which the creditor retains ownership to the vehicle, which left much to be desired under the demoralizing influences of the inflation period, is on the increase again. Mr. Buschmann says it would be very desirable that official registration of the ownership-retention in the motor-vehicle registration lists, which has been repeatedly suggested to the Government by the Association, should be accorded.

Compulsion of the purchaser to take out insurance when buying a car on the time payment plan is regarded as a burden, in view of the high rates charged. In the motorcycle business this requirement already has been dropped in most cases, without the credits being jeopardized thereby.

There is much difference of opinion regarding the advantages of insuring credits, or rather, insuring against losses from credit operations. In the form in which such insurance is offered by most firms it seems of little value, since the seller must himself take up the notes if they are not paid when due, must sue on the notes and must recover the vehicle himself, and he has a right to make claim for indemnity only after months, when it is found, in most cases, that no losses were sustained.

FOR the purpose of furthering the use of specifications by public and private purchasers, the Department of Commerce has compiled a directory of commercial testing and college research laboratories where purchasers of goods may have samples tested to determine if they agree with purchase specifications.

Commercial testing organizations and college research laboratories are listed separately and alphabetically. This directory is Miscellaneous Publication No. 90 and may be obtained from the Superintendent of Documents, Washington, for 15 cents.

AUTOMOTIVE NEWS SECTION INDUSTRIES

Philadelphia, Pennsylvania

Saturday, June 25, 1927

Seasonal Conditions Bring Industry Activities Lower

PHILADELPHIA, June 25—Seasonally unsettled conditions are affecting automotive production and sales. The trend in output is still downward, and the moderate curtailment shown in June will be followed by further slackening in July, according to schedules being laid out by several important producers.

High pressure selling campaigns have served to maintain sales for some companies despite the seasonal reluctance of buyers. Although the sales peak was passed several weeks ago, the situation from the viewpoint of the factories is not changed fundamentally—some companies are able to keep up a satisfactory volume and others are not. There is no such thing, in production or sales, as an average for the industry that means anything to a particular producer.

So far this year there has been no new development in general or sectional business to affect seriously the market for motor vehicles. The Mississippi floods naturally almost entirely put an end to sales in the areas affected, but the region was never an important market. In the period of reconstruction a good demand for heavy duty trucks is expected. The bituminous coal strike is not felt except in the points directly involved.

While buying in the agricultural districts has not been up to par this year, the recently rising level of commodities, if sustained on the new crops, is confidently expected to bring about greatly improved conditions, and these may come in time to add considerably to the year's sales, in the opinion of automotive observers.

Chrysler Reports 40 Per Cent Gain

DETROIT, June 23—"From January to June 1, this year, Chrysler Corp. produced 85,330 cars, as compared with 61,541 for the same period last year or a gain of nearly 40 per cent," reports Walter P. Chrysler, president.

"May, 1927, production totaled 17,894 cars as compared with 14,598 in May, 1926. Retail deliveries of cars in May, this year, were the largest in the history of the company. During the first five months of 1926 we exported 6079 cars. This year during the same months we shipped overseas 11,750, a gain of 94 per cent.

"Dealer stocks are normal. Business has been good as the records will indicate and the outlook is excellent for the balance of the year.

Citroen Schedules Now Over 400 Daily

PARIS, June 13 (*by mail*)—To commemorate the regular production of 400 cars per day, Andre Citroen invited about 450 heads of departments to dinner in Paris, this week. For the past 15 days Citroen's daily production of complete units, this including cars assembled in Paris and those shipped abroad for assembly in foreign plants, has been between 405 and 412.

In thanking his staff for their assistance, Andre Citroen stated that they must not consider 400 as the daily high-water mark. The task now before them was to attain 600 cars a day, which ought to be possible by next year, and after that they would have to attain 1000 cars per day, the capacity of the present works. Citroen stated that his policy would continue to be a reduction of the cost of production with, as a consequence, a lower selling price or a better automobile selling at the present price.

He also announced that the financial position of the company had been considerably strengthened by the offer and acceptance, on satisfactory terms, of 200,000,000 francs of fresh capital.

Citroen now has assembly plants operating in England, Germany and Italy and is erecting a plant in Scandinavia.

Page New Bliss President

NEW YORK, June 22—Directors of the E. W. Bliss Co. today elected F. C. B. Page president to succeed the late James W. Lane. Mr. Page was formerly first vice-president. Frederick D. MacKay was made vice-president, his former position having been second vice-president.

Butler Heads Toledo Sales

TOLEDO, June 23—E. J. Butler is the new sales manager of the Toledo Steel Products Co. Mr. Butler has been one of the company's most successful salesmen, having represented Toledo valves in the Middle West for several years. He is succeeding F. H. White, who will have charge of Pacific Coast sales.

16 Makers Enter National Air Tour

DETROIT, June 22—Sixteen airplane builders have entered 24 planes in the National Air Tour which starts here Monday. Seven of these are manufacturers who have entered the field during the past year. The complete entry list of makers follows:

Ford Motor Co., Buhl Aviation, Hess Airplane Co., E. P. Hurd, Stinson Aircraft Corp., Curtiss Wright Aeronautical Syndicate, Advance Waco, Hamilton Metal Plane Co., National Airways System, Irwin Aircraft Co., American Eagle Aircraft Corp., Alexander Aircraft Co., Kreider Reinser Co., Ryan Aircraft Co., Pitcairn Aviation, Inc.

Department of Air Proposed in Bill

WASHINGTON, June 23—The creation of a Department of Air, with a cabinet officer at its head, will be submitted to Congress when that body convenes in December. This was announced here this week by Rep. Sol Bloom of New York, who announced that he had already begun work on a bill with this end in view. The Department would take over and perform all the air duties now assigned to the Departments of War, Navy, Post Office, Commerce and all other federal agencies, as well as supersede the National Advisory Committee for Aeronautics.

For the department's personnel, Mr. Bloom declares that he would build the structure entirely from men now engaged in the automotive and aircraft industries, "with the best man obtainable in this line for the position as Secretary of Air."

La Salle Averages 95 M.P.H.

DETROIT, June 22—A standard La Salle roadster, with fenders and windshield removed, was driven 951 miles in 9 hr. 59 min. and 39.4 sec., or an average of 95.3 m.p.h. at the General Motors Proving Grounds, Monday, as an engineering high speed test of durability. The car had 3½ to 1 gear ratio, slightly higher compression and camshaft slightly altered for high speed work and muffler removed; otherwise engine and chassis were standard.

Ford Says Details Impossible Now

Specifications Still Incomplete Declares Statement—Avoids Production Problems

DETROIT, June 23—Prolongation of the date on which Ford Motor Co. is to announce the details of its new light car gave rise this week to publication of what purported to be an outline of the features of the new car. This was followed immediately by a repudiation by Edsel Ford in which he said "it would be impossible for any one, even in the Ford organization, to discuss the new car features with accuracy and with authority."

Contact with Ford factories here indicates that the work of getting parts for the new car into production is proceeding slowly and that up to the present time the number of these is so few that any information that might be gleaned in this way is of the most meagre sort. Until at least the major portion of the parts is in production a general outline of the new car would be impossible to anyone except the highest of the Ford executives.

This slowness in getting into production is attributed to two causes. The first of these is that there be no manufacturing difficulties such as arose with the introduction of the last model improvement in September, 1925. The second is that dealers be given plenty of time to clear away any of the former models and also to whip used car stocks into shape to handle the new car in large volume.

Dealers Get Cars Late in July

It is indicated that the first of the new cars will go to dealers in the latter part of July. There is every probability that the official announcement on the new car will not precede dealer shipments by any long period. This would bring the official statement to about July 15 but those in position to know say that no definite time can yet be set for the announcement.

The report as published this week merely added to the consensus that it will be a gear shift car, that the new engine will have a rating of 34 hp. designed to operate at 2400 r.p.m., giving a speed of 60 m.p.h. and that it would have numerous items of equipment appearing on most of the lower priced cars which formerly had not been built into the Ford car at the factory.

A touch of originality was added to the former general forecasts by saying that the four-wheel brakes, with which the new car has been credited, were designed by Henry Ford personally. A price range of $450 to $490 was somewhat at variance with the expectation that the new car would be at prices probably ranging from about $500 to above $600.

The reference in the story to "transverse springs similar to those in use on expensive foreign cars" gives evidence of inexactness.

The Edsel Ford statement, issued through N. W. Ayer & Son, said:

"The specifications for the new car are not yet complete, and it would be impossible for any one, even in the Ford organization, to discuss them with accuracy and with authority. No statement as to the details of the new cars has been made and none can be made at this time."

Car Export Gains Exceed Other Lines

WASHINGTON, June 23—Automotive exports from the United States for the first quarter of this year show a much greater gain than do the exports for other commodities. The figures just announced by the Department of Commerce show that during the quarter the exports amounted to $1,200,916,000 for all commodities. This figure was an increase of 7 per cent over the exports for the first quarter of last year.

Comparing the averages, the figures show that while the total's average increase was 7 per cent, the exports of automobiles, parts and accessories, increased 12 per cent in quantity and 13 per cent in value. Shipment of motor trucks and buses increased 53 per cent in quantity and 37 per cent in value.

Excise Tax Collection Drops $4,000,000 in May

WASHINGTON, June 23—The 3 per cent excise tax, collected from the sale of passenger cars and motorcycles sold during May netted the Federal government $5,435,103, compared with $9,661,526 collected in May, 1926.

Figures just compiled by the Internal Revenue Bureau show that the collection for the first 11 months of this fiscal year total $58,796,670, compared with $107,860,605 collected in the first 11 months of the 1926 fiscal year. Of the total excise tax collected in May of this year approximately 6 per cent was collected from the automotive industry, the total collection for May being $98,044,773.

W. J. Lobdell, Sr.

DETROIT, June 22—W. J. Lobdell, Sr., 63 years old, principal owner of the Emery Lobdell Mfg. Co., Alma, Mich., died in Cleveland this week of injuries suffered when his automobile was hit by a train. He established the Alma plant 18 months ago after fire had destroyed the American Wood Rim Co. at Onaway, Mich., with a $1,000,000 loss. The company is reputed the largest manufacturer of automobile steering wheels.

Mr. Lobdell was born in Marietta, Ohio, where he first began the manufacture of golf clubs and hammer handles.

Business in Brief

Written exclusively for* AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co.

NEW YORK, June 23—The chief financial development of the last week was the announcement of a new high record in brokers' borrowings from the member banks of the Federal Reserve system in New York City. Stock prices continued to advance last week, though with increasing irregularity. Commodity prices were virtually unchanged. Money rates remained at practically the level of the preceding week, with a slight tendency toward greater ease. Trade in general was somewhat hampered by unfavorable weather, while the principal industries continued under the influence of seasonal factors making for moderate recession.

FOREIGN TRADE

The preliminary foreign trade report for May shows exports of $394,000,000 and imports of $346,000,000, as compared with exports of $415,000,000 and imports of $376,000,000 in April and exports of $357,000,000 and imports of $321,000,000 in May last year.

BANK DEBITS

Bank debits to individual accounts reported to the Federal Reserve Board for the week ended June 15 were 5.9 per cent smaller than the total for the preceding week but 6.9 per cent above that for the corresponding period in 1926.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices stood at 140.3 last week, as against 140.4 a week earlier and 140 four weeks earlier. The monthly wholesale price index of the Bureau of Labor Statistics declined from 144.2 in April to 144.1 in May.

FEDERAL RESERVE BANKS

Bills and securities held by the Federal Reserve banks increased $31,200,000 during the week ended June 15, declines of $38,300,000 in discounts and $39,100,000 in open market purchases having been more than offset by a gain of $109,200,000 in government securities. Note circulation declined $18,500,000, while deposits increased $83,200,000 and reserves $15,500,000. The reserve ratio declined from 77.2 to 76.4 per cent.

During the same period, loans of reporting member banks increased $67,000,000, with the gain about evenly divided between security and commercial loans. Investments rose $220,000,000, net demand deposits $383,000,000 and Government deposits $165,000,000, while borrowings from the Federal Reserve banks declined $43,000,000.

The call loan rate ranged from 4 to 4¼ per cent last week, as against 4 to 4½ per cent a week earlier. Time loan rates remained easy at 4¼ to 4½ per cent and commercial paper rates at 4 to 4½ per cent.

Production in May Reaches 422,149 Total

Non-Members of N. A. C. C. Show Total of 80,100—Truck Output Steady

WASHINGTON, June 20—Production of cars and trucks in the United States and Canada reached 422,149 in May, according to releases by the Department of Commerce this week. This compares with a total of 446,137 in May last year. For the five months the 1927 total is 1,820,808 as against 2,045,127 in 1926.

Production of cars and trucks in May by companies having membership in the National Automobile Chamber of Commerce was approximately 342,100. This leaves an approximate production of 80,100 for Ford Motor Co. and others who are not members of the chamber. Aside from Ford, the non-members of the chamber are truck companies, most of whose production is limited.

The passenger car output by United States factories in May was 352,268 which compares with 353,076 in April and with 373,140 in May last year. Truck production in the United States totaled 44,173 as against 44,553 in April and 44,071 in May last year.

Canadian production of passenger cars totaled 21,991 in May, comparing with 20,890 in April and 21,429 in May last year. Canadian truck output was 3717 in May as against 3721 in April and 3503 in May, 1926.

For the five months' period the United States passenger car total was 1,504,658 in 1927 as against 1,730,848 in 1926. Trucks built in the United States in the same period totaled 209,254 as against 194,657 in 1926. Canadian passenger car output in the five months was 106,973 as against 103,127 in 1926, and Canadian truck output was 18,432 as against 19,238.

Elcar Increases Bore

ELKHART, IND., June 18—An increase in power has been obtained by the Elcar Motor Co. in its model 8-82 by increasing the bore of the engine from 2¾ to 2⅞ in. The displacement is now 246.6 cu. in. The only other chassis change announced now is the use of oil cups for lubricating instead of pressure fitting. Prices of the various body styles on this chassis are to remain unchanged.

Irish Railroads Use Buses

WASHINGTON, June 18—Inauguration of motor bus services by the Great Southern Railways of Ireland to meet the growing competition of omnibus companies running parallel services, was reported this week to the U. S. Department of Commerce. The railroad already has three such services in operation and is considering establishment of additional bus lines.

Five Months' Output is 224,219 Below 1926

1926

	Cars	Trucks	Total
Jan. ...	285,703	33,517	318,220
Feb. ...	334,524	41,784	376,308
March .	399,105	49,386	448,491
April ..	401,836	54,135	455,971
May ...	394,569	51,568	446,137
Total	1,814,737	230,390	2,045,127
June ..	358,388	47,265	405,653
July ...	329,959	41,873	371,832
Aug. ..	393,064	47,836	440,900
Sept. ..	363,547	51,257	414,804
Oct ...	300,160	46,985	347,145
Nov. ..	226,278	39,430	265,708
Dec. ...	143,413	30,161	173,574
Total	3,929,546	535,197	4,464,743

1927

	Cars	Trucks	Total
Jan. ...	208,731	40,873	249,604
Feb. ...	275,467	41,947	317,414
March .	360,764	48,700	409,464
April ..	373,961	48,216	422,177
May ...	374,259	47,890	422,149
Total	1,593,182	227,626	1,820,808

Gramm Motors Increases Capital Stock Issues

DELPHOS, OHIO, June 20—Gramm Motors, Inc., has filed papers with the secretary of state amending the articles of incorporation by changing the stock issues of the company. The number of shares of 7 per cent preferred stock is increased from 1000 to 2500 of $100 par value. The number of shares of common stock is increased from 5000 to 6500, with no par value designated.

The amendment further provides that if four consecutive dividends on the preferred stock are passed, preferred stockholders are given a vote at any stockholders' meeting and retain this voting privilege until all past due dividends are paid.

Yellow to Leave Moline

EAST MOLINE, June 18—The Yellow Sleeve Valve Engine Works, established here in 1922 when Yellow Sleeve purchased one of the main buildings of the Root & Vandervoort plant, will be moved to Pontiac, Jan. 1, Paul W. Seiler, president of Yellow Truck & Coach Mfg. Co. announced this week.

For a time this community was considered for the giant building program but because so many activities centered at Detroit decision was finally made in favor of the Pontiac location.

Velie Adds Sedan at $1,325

MOLINE, June 20—Velie Motors Corp. has added a five-passenger de luxe sedan, priced at $1,325, to the Standard Six line. Upholstery is of chase velmo mohair, set off by arm rests, with rear quarter curtains to match. The finish is in two-tone high luster lacquer in two optional selections. Equipment includes front and rear bumpers, spare tire and cover, and radiator emblem. The bodies are of composite type and are Velie built.

Pitcairn Plane Flys 135 Miles in Hour

Is First of Fleet for Atlanta Air Line—Enters Reliability Tour

PHILADELPHIA, June 21—Tests of a new plane developed by Pitcairn Aviation, Inc., for air mail work, showed the plane to have a speed of 135 miles an hour carrying a 600 lb. load. The plane is one of nine being built by the Pitcairn company for air mail service between New York and Atlanta. The planes are to carry 600 lb. each and are to fly entirely at night making six stops between the New York and Atlanta terminals.

The planes were designed by Agnew Larsen and are under construction at the Pitcairn plant at Bryn Athyn, near here. They are equipped with Wright Whirlwind engines similar to those used in the trans-Atlantic flights.

Following its test here, this first plane will be flown to Detroit where it is entered in the National Commercial Airplane Reliability Tour which starts June 27.

Packard Delivers First of "X" Airplane Engines

DETROIT, June 20—The first of its new model "X" aircraft engines completed by the Packard Motor Car Co. aircraft engine division, has been subjected to dynamometer tests and has been delivered to Kirkham Products Co., which has built a high speed seaplane for the purpose of regaining the world seaplane speed record taken from the United States last year by Italy.

The engine, which is the property of the Navy Department, has four banks of six cylinders each, arranged in "X" form. On dynamometer tests it has shown itself capable of developing a steady 1250 hp. at 2700 r. p. m. It has a bore of 5⅜ in. and a stroke of 5 in., giving it a piston displacement of 2775 cu. in. Dry weight of the engine is 1402 lb. thus giving it a horsepower weight ratio of 18 oz. per horsepower.

A feature of the engine, due to the "X" type of construction, is its unusually high power as compared to frontal area, one of the most important features for high speed work. It develops 161 hp. for each square foot of frontal projected area, as compared with 126 hp. per sq. ft. for the Packard 2500.

Rubber Imports 34,233 Tons

WASHINGTON, June 22—May imports of crude rubber into the United States totaled 34,233 long tons, having a value of approximately $28,000,000, according to import figures just announced by the U. S. Bureau of Foreign and Domestic Commerce. Of the total imports 84.7 per cent was consumed by the automobile and tire industries.

Kansas City Sales 71 Cars Under 1926

Decrease in Ford Total Exceeds Gains By Most Other Manufacturers

KANSAS CITY, June 18—Chevrolet continues to lead the field in motor car sales in Kansas City with Ford holding second place by a safe margin Total sales of all makes for the month were 71 cars behind sales of May, 1926, but the higher priced cars have shown a substantial gain in most cases. Chevrolet sales for the month were 428 as against 187 for May, 1926, while Fords dropped to 220 for the month from 536 last year. The May, 1926, figure for the two cars was 743 while the 1927 figure is 648, a loss of 96 cars on the two makes. One of the big gains in the month was made by Whippet, a total of 51 being reported as against 11 Overlands in May, 1926.

Studebaker sales increased to 43 for May this year from 15 for May, 1926. On top of this, four Erskine models were sold in May. Hudson and Essex models sold in May totaled 115, 92 Essexs, and 23 Hudsons, against 91 for both cars in May, 1926. Buick sales were 83 against 86 for May, 1926. Oldsmobile dropped from 28 last year to 16 this year.

The total sale for Kansas City this May was 1267 and for St. Louis 2267, with the figure for May last year being Kansas City 1338 and St. Louis 2602. Last year there were 939 Ford cars sold in St. Louis in May and this year there were 226.

Some of the other figures for May this year were: Auburn 4, Cadillac 9, Chandler 7, Chrysler 39, Dodge 56, Falcon-Knight 2, Flint 9, Franklin 6, Gardner 4, Hupmobile 12, Locomobile 1, Lincoln 1, Marmon 7, Nash 22, Oakland 18, Packard 17, Paige 7, Peerless 11, Pierce-Arrow 6, Pontiac 34, Reo 10, Star 16, Stearns-Knight 1, Stutz 1 and Willys-Knight 5.

Peerless Exports Triple

CLEVELAND, June 20—Export shipments of Peerless Motor Car Corp. in the first six months of the year will be approximately three times as large as shipments in the same period last year, according to C. A. Tucker, general sales manager. The new Six-60 models have proved especially attractive to foreign buyers, Mr. Tucker said.

Ford Closes Boston Plant

SOMERVILLE, MASS., June 18—More than 1000 employees were laid off today at the local assembly plant of the Ford Motor Co. According to the men the layoff is to be six or eight weeks to get the plant ready for assembly work on the new model. No actual manufacturing is done at this plant, but the need of changing over of machinery was expected.

World Count Shows 27,650,267 Vehicles

WASHINGTON, June 23.—There were 27,650,267 passenger cars, trucks and buses in operation throughout the world on Jan. 1, of this year, according to a world census of automobiles, just made public by the U. S. Department of Commerce here this week. The figures indicate an increase of 3,176,638 in the world registration during the 12 months period.

Of the total, 80 per cent, or 22,137,334, are in the United States. The United Kingdom was second with 1,023,651; France, third, with 891,000; Canada, fourth, with 826,918. Other leading countries, in order named being Australia, 365,615; Germany, 319,000; Argentina, 222,610; Italy, 138,177; Spain, 135,000 and New Zealand, 123,224.

Chevrolet Continues High in Cincinnati Territory

CINCINNATI, June 18—Chevrolet for the eighth consecutive month led new car registrations in Hamilton County in May, this performance being climaxed by the exceptional record of 972 Chevrolet sales during April. Statistics show the steady increase has carried Chevrolet to the point where, out of 10 low priced cars sold here, an average of almost six are Chevrolets. Following is a table of percentages in this low price market for the first quarter of 1927, issued by the Chevrolet plant at Norwood:

Chevrolet	54.5%
Largest competitor	22.5%
Second competitor	8.1%
Third competitor	5.9%
Fourth competitor	5.4%
Fifth competitor	2.6%
Sixth competitor	1.0%

Cincinnati Sales Lower

CINCINNATI, June 18—Hamilton County registrations for May bear out forecasts of leading dealers that sales, while highly satisfactory, would be below those of last year. New car registrations last month were 1898 against 2234 for May, 1926, a decrease of 338. Used car sales, however, were close to the mark set last year, the total for last month being 5382 against 5404.

Two factors are held responsible for the new car decrease, the slump in Ford sales, due to rumors regarding his new car and the miserable weather conditions.

Cadillac Offers Town Car

DETROIT, June 20—Cadillac Motor Car Co. has introduced a line of Cadillac town cars with custom built bodies by Fisher, Fleetwood, Brunn and Willoughby.

Car Outlook Sound in Northwest States

Railway Traffic Men See Large Demand — Driveaways Reduce Shipping

SPOKANE, June 18—Business interests of the Pacific Northwest States may expect a continuance of prosperity for the next three months at least, it was indicated here by reports of committees of the Pacific Northwest Advisory Board. Predictions were that general business would be "fair to good" during the period.

The meeting was the largest ever held by the Pacific Northwest group and the third largest ever held by any of the 14 groups of the United States. Of the 515 attending the sessions 256 were shippers and 242 were representatives of railroads, the latter there to learn the requirements for railroad cars during the coming three months.

Reports of the automotive committee showed a decrease in railroad cars required, new figures being 502 against 629 for last year. The decrease will not be due to falling off in automobile buying, it was reported. Many dealers are buying cars and with improved roads, are driving them to distribution points.

Indiana Sales in May Below Former Totals

INDIANAPOLIS, June 18—New car sales in Indiana in May dropped off sharply from April sales and were under the sales in May, 1926, according to the report compiled by the Indianapolis Auto Trade Association. Total sales in May this year were 10,903 as compared with 12,484 in April this year and 11,338 in May, 1926.

The drop in Ford sales accounted for more than 500 of the decline in May from April, and at the same time there was a falling off of more than 200 in Chevrolet sales. Nevertheless Chevrolet led Ford in sales for the second consecutive month in Indiana with 2712 as compared with 2362. Other leading cars remained near the April figures, some being slightly below and others slightly above.

Builds New Carburetor

WASHINGTON, June 23—A new carburetor for automobiles in which kerosene and other fuels with higher specific gravities than gasoline can be used has been constructed by a Swedish firm at Malmo, Sweden, according to advices received by the Department of Commerce from the office of the American consulate general at Stockholm. The American industry interested in the invention may secure additional data through the department.

A system of plates in the intake manifold improves the atomizing, the report says, adding that tests are reported to have been successfully made at a cost of 4.8 cents per six miles.

Men of the Industry and What They Are Doing

H. H. Tewksbury is Named to South American Post

Howard H. Tewksbury, manager of the Detroit district office of the Department of Commerce, has been promoted to the post of automotive trade commissioner for South America. This follows the appointment of H. H. Kelly as special automobile trade commissioner in Europe and is in line with the plans of the department to increase its facilities for the automotive industry.

Mr. Tewksbury was the first manager appointed to the Detroit office on its opening three years ago. Previously he served with the automotive division in special capacities, for a time, being attached to the Havana office.

Palmer Succeeds Kimball

William A. Kimball, purchasing agent of the New Departure Mfg. Co. for the past 20 years, has resigned from the company after a year's leave of absence and has purchased an estate at Newtown where he will make his home. Orville R. Palmer, who has been assistant purchasing agent, succeeds Mr. Kimball, and Mr. Palmer is succeeded as assistant purchasing agent by T. E. Reynolds.

Tattersall Named President

James C. Tattersall has been made president of Fitzgibbon & Crisp., Inc., Trenton, manufacturers of commercial bodies. Hudson T. Winner was chosen vice-president and general manager.

Wheelock Joins Harvester

Henry T. Wheelock, former advertising manager of Velie Motors Corp., and recently sales manager for the Moline Pressed Steel Co., has joined International Harvester Co. and will be assigned to the motor truck sales division at Milwaukee.

Hanford Leaves Indian

Parmlee Hanford, secretary and treasurer of the Indian Motocycle Co. has tendered his resignation. Mr. Hanford entered the employ of the then Hendee Mfg. Co. 10 years ago. He organized and managed the legal department.

Anderson Heads Bank

Robert H. Anderson, 2nd, vice-president and superintendent of the Keasbey & Mattison Co., Ambler, Pa., manufacturers of asbestos products, has been elected president of the Ambler Trust Co.

Named Bank Official

Harry S. Finkenstaedt, son of F. C. Finkenstaedt, of Bay City, a pioneer in automotive circles, has been made a vice-president of the Griswold-First State Bank of Detroit.

H. J. C. Henderson

Now sales and advertising manager of Fisher Body Corp., following his resignation as sales manager of the Lincoln Division of Ford Motor Co.

I. H. C. Advances Officials

Alexis V. Olson, general engineer at the Tri-City plant of the International Harvester works, has been advanced to manufacturing engineer in charge of a number of Harvester factories in the Chicago district. C. R. Landolt, superintendent of the Tri-City tractor plant foundry, has been made foundry manager of the principal Chicago factory. Cal Johnson succeeds Mr. Olson as tractor plant engineer, and L. C. Rice has been named successor to Mr. Landolt in the foundry department.

Olds Host to Export Men

Officials of Olds Motor Works were hosts to 20 executives of General Motors Export Co. who visited the plant on an inspection trip and for discussion of future plans for foreign business. Talks were given by J. D. Mooney, president of the export company; I. J. Reuter, president of Olds, and D. S. Eddins, vice-president and general sales manager of Olds.

Attend Lindbergh Dinner

Automobile officials listed at the dinner in honor of Col. Charles A. Lindbergh tendered by the Aeronautical Chamber of Commerce of America at the Waldorf-Astoria Hotel, New York, included Walter P. Chrysler, A. J. Brosseau, F. E. Moskovics, H. E. Coffin and J. S. Marvin.

J. A. Morris Joins Autocar as Assistant Sales Head

J. A. Morris, for many years prominently identified with the sale of Mack trucks for the International Motor Co., has joined the Autocar factory organization as assistant sales manager. In the Autocar organization, Mr. Morris will be the traveling executive in charge of dealers and dealer sales. He has been identified with the motor truck industry since 1911, when he joined the International organization as a salesman.

In 1912 he became the Mack district manager at New Haven and in 1913 he went into business for himself as distributor of Mack trucks, opening branches of his own business at Bridgeport, New Haven, Hartford, New London, and Waterbury, Conn., and Springfield, Mass. In 1919, Mr. Morris sold this business to Mack Trucks, Inc., and operated it for them for about one year. In 1920, he transferred to the New York office and since 1922 he has been in business for himself, operating the Auto Trucking Agency in New York City.

London and Thornton in Change

M. "Jack" London, who has been manager of the Detroit office of Pittsburgh Steel Products Co., has been transferred to Pittsburgh as district manager. T. F. Thornton has been appointed to succeed Mr. London as district manager at Detroit. Mr. London has been associated with Pittsburgh Steel Products Co. for 15 years, having served the company in various capacities. Mr. Thornton was connected with Detroit Steel Products Co. as purchasing agent for 13 years. Later he was president of the Roehm Steel Rolling Mills, Detroit, and lately has been manufacturers' agent handling automotive products.

Pontius Joins Gardner

George W. Pontius, Jr., has been made parts and service manager of Gardner Motor Co. Mr. Pontius has had long experience in the service field, having previously served with the Studebaker Corp. and with Rickenbacker Motor Co. in similar capacities. He is now on an extended trip through the territory, meeting distributor and dealer service managers previous to taking over active direction of this department at the factory.

A.C.F. Transfers Abell

Carl Abell, advertising manager of the American Car & Foundry Motors Co., has been transferred to the Pacific Coast sales force. He will be succeeded by James J. McMahon, formerly of the sales promotion department of the International Motor Co. who has been identified with the motor bus industry for the past four years.

High May Business Shown by M.&A.M.A.

High Releases in July Seen With New Models—Outlook Declared Good

NEW YORK, June 21—A surprisingly high rate of business for parts and accessory makers in May is reported by members of the Motor & Accessory Manufacturers Association, and while some recession is evidently in progress this month it is by no means severe and there already are indications that another upturn will be recorded in July.

Original equipment shipments in May were 184, a drop of only one point from the April figure and comparing with 145 in May, 1926, indicating a continued good volume of car and truck manufacturing. These figures are the index numbers of the association, being based in all cases on January, 1925, shipments as 100.

Replacement parts showed a gain in May, when a figure of 123 was reached against 117 in April. There was quite a drop, however, from the May, 1926, index of 177.

In accessories a lower volume than last year's is again shown. The situation is generally credited to the more active distribution of accessories by car manufacturers but it also may be partly due to the heavy recession in Ford sales. The accessory index was 131 in May against 156 in April and 183 in May, 1926.

Shop equipment shipments had a drop in May in line with the seasonal trend but gained over the corresponding period a year ago. The May total was 192 against 223 in April and 175 in May, 1926.

The grand index of all shipments by members of the M. & A. M. A. was 172 in May, a drop of only three points from April and comparing with 150 a year ago.

The general feeling in the association is that the first six months of the year has been on the whole a prosperous one for the entire industry, with volume particularly satisfactory. Profits for all companies have not been all that could be expected, due to the very keen competition which has forced down prices. The outlook for the latter half of the year is declared to be very good, especially so in original equipment as there are indications of very heavy July releases by car and truck manufacturers as they swing into new model production.

The parts industry is in excellent manufacturing condition, with very low inventories of materials.

Taylor Appointed Manager

NEW YORK, June 21—E. A. Taylor has been appointed manager of the Yellow Sleeve Valve Engine Co., Moline. Mr. Taylor has been with this company three and one-half years.

Nash New Models to be Ready June 29

KENOSHA, June 20—Nash Motor Co. announced today that on June 29 it will introduce three entirely new series of cars featuring sweeping changes and improvements throughout the line. According to the company, the new models will mark a new step forward in the manufacture of motor cars both in beauty of appearance and mechanical perfection.

In all three series, including the Special Six, the Advanced Six and the Standard Six, a number of improved mechanical refinements will be presented to increase performance and ease of operation.

Steel Treaters Prepare Papers for Convention

CLEVELAND, June 20 — Among those who will read papers at the annual convention of the American Society for Steel Treating, which will be held in Detroit in the week of Sept. 19, are the following: A. H. d'Arcambal and H. J. Fishbeck, Pratt & Whitney Co.; H. W. Dunbar and Mr. Beecher, Norton Co.; George A. Dornin, Gathmann Engineering Co.; B. H. DeLong, Carpenter Steel Co.; G. M. Eaton, Molybdenum Corp. of America; F. B. Foley, Midvale Co.; E. R. Frost, National Machinery Co.; H. J. French, Bureau of Standards; H. M. German, Universal Steel Co.; Marcus A. Grossmann, Central Alloy Steel Corp.; J. P. Gill, Vanadium Alloys Steel Co.; S. L. Hoyt, General Electric Co.; M. Houston, International Nickel Co.; Dr. Benj. Kjerrman, S.K.F., Gothenburg, Sweden; H. G. Keshian, Chase Metal Works; W. M. Mitchell, Central Alloy Steel Corp.; J. B. Mudge, Western Electric Co.; W. J. Merten, Westinghouse Elec. & Mfg. Co.; Richard Rimbach, Bacharach Industrial Instrument Co.; George Satterthwaite and H. B. Allen of Henry Disston & Sons, Inc.; Howard Scott, Westinghouse Elec. & Mfg. Co.; F. L. Wright, Atlas Ball Co.; W. H. White, Duquesne Steel Foundry Co.; A. V. deForest, American Chain Co.; E. C. Bain of Union Carbide & Carbon Research Laboratories, and W. P. Sykes, General Electric Co.

Plan Singapore Assembly

WASHINGTON, June 23—Plans are being made for the establishment, by a British motor manufacturer, of the first English motor assembly plant in Singapore, Straits Settlements, according to cable received by the U. S. Department of Commerce. The company is the Thornycroft Singapore, Ltd., which will take over the Singapore branch of John R. Thornycroft & Co., Ltd.

Rubber Pool to Run Eight More Months

Market Strengthened by Announcement and Prices Rise Above 36

NEW YORK, June 23—Weakness in the rubber market, which in the early part of the week brought prices below 35 cents for nearby positions, was overcome in the later trading on the Rubber Exchange. Closing prices on Wednesday for July were 36.30, a gain of almost a full point from the previous close of 35.40.

Some confidence was given to holders of rubber by the announcement that the American pool of rubber goods producers and car manufacturers had been extended for eight months from Aug. 7 next, when it would have automatically expired. Rumors that the pool was liquidating had been one of the causes for the heavy selling.

Considerable interest also was shown in the statement by the British Colonial Secretary that "the government is not contemplating the abolition of restrictions." The statement, however, was subjected to sharp analysis by F. R. Henderson, president of the Rubber Exchange, who said:

"Abolition of restrictions is out of the question at the moment and it is significant that no reference was made to the possibility of modification. We anticipate modification, if not before, surely on Nov. 1. This will probably mean a lowering of the pivotal price, but the higher prices for rubber in the last two years have stimulated production in areas other than those affected by the restriction law."

Mr. Henderson was inclined to credit the slump in rubber to a continuance of heavy arrivals of crude from the producing centers, coupled with the failure of consumption to meet expectations held earlier in the year. Figures are cited to show that consumption of reclaimed rubber has been close to one-half the consumption of new rubber. In May, it is figured, for instance, that 34,592 tons of crude were consumed against 15,360 tons of reclaimed rubber.

British Tire Exports Show Decline in April

WASHINGTON, June 23—A current decline in exports of automobile tires and tubes from Great Britain during April is reported to the rubber division of the U. S. Department of Commerce. The April exports, however, were approximately 5000 in number over the average for the first six months of 1926.

The value of the April casings exported was $955,836, the unit value being $11.94 and next to the highest price of the year and exceeded only by the January figure of $12.30. Four of the five principal markets are Empire countries.

Steel Mills Expand Automotive Capacity

Higher Rate of Consumption Seen Needed to Sustain Mill Activity

NEW YORK, June 23—Latest developments in the steel industry indicate that rolling and finishing capacity for the production of those descriptions of steel in which automotive consumers are chiefly interested—sheets and strip-steel, is being impressively expanded, and that in a year or two the 5,000,000 tons of demand which last year kept sheet and strip mills fairly busy will no longer suffice to keep them operating at anywhere near capacity.

With announcement that a new sheet mill unit of an important rolling mill interest has a daily capacity of 1400 tons (and this may be further enhanced), it is also becoming more and more apparent that engineering ingenuity is rapidly paving the way for sheet rollers to overcome the handicap which that branch of the industry feared had been imposed upon it by the continuous strip-mill.

Last year's strip-steel output aggregated approximately 1,250,000 tons. With the expansion plans of important interests now progressing toward completion before the end of the year, strip-mill capacity will be lifted to a level calling for a much higher rate of consumption if the operating rate is to be a fair one. With the certainty of so marked an increase in productive capacity and the uncertainty that surrounds the growth in demand, it is natural that consumers take a very optimistic attitude regarding their position in the market from a long range point of view.

For the present the market is marking time, rollers of full-finished automobile sheets adjusting their operating schedules to the lull which they hope is temporary. Stripsheets have now come to be recognized by the trade as the proper designation for cold-rolled strips of 12 in. and greater width, and the term "cold-rolled strip" is now used only to refer to material under 12 in. wide. The latter carry allowances for quantity, ranging up to 25 cents for 18 net tons and over of one size and one temper ordered at one time whereas the stripsheet price list is not subject to such quantity allowances.

Pig Iron—The Valley price for No. 2 foundry iron is now on an $18 basis. In Detroit the quotation continued up to the beginning of this week to be unchanged at $19, furnace. In the Cleveland market, however, parity with the valley market prevailed. Automotive foundries are showing lively interest in the proposed classing of castings with steel in rail freight rates, a matter now engaging the attention of the Interstate Commerce Commission.

Aluminum—The market is devoid of new developments. A rather light volume of demand is noted for No. 12 alloy and buying of aluminum sheets by automotive consumers has dwindled to negligible proportions. The "outside" market is weak but the pegged price of the domestic producer acts as a prop in the present dullness.

Copper—Dullness in the copper market is becoming more and more pronounced and some authorities say a crisis is approaching. The leading brass interest has changed the nomenclature of brasses, especially with a view to eliminating the frequently misunderstood meaning of "high" and "low" brasses, the "high" and "low" referring to the zinc and not the copper content.

Tin—Easy and quiet.

Lead—Fairly active at unchanged price levels.

Zinc—Market easy amid light demand.

Seaboard Applies for Bus Franchise

RALEIGH, N. C., June 18—Indications that the railroads of North Carolina are preparing to enter into open competition with the bus lines is seen in the application of the Seaboard Air Line Railway before the State Corporation Commission for permission to operate a fleet of motor buses from its western terminus at Rutherfordton, to Asheville, about 60 miles.

It has always been understood as the intention of the Seaboard to join this link between its present terminus and the mountain metropolis with a link of steel, but construction would be difficult and costly, and so the years have gone by without the completion of the line. Now the state has stepped in to put a hard-surface road across the mountains, connecting the two cities, and independent bus companies have been covering the route for some time.

Oakland Completes Work on $2,000,000 Improvement

DETROIT, June 18—The $2,000,000 improvement program recently started by the Oakland Motor Car Co. to double the Oakland car production facilities has been completed. When all Pontiac machinery was removed to the new Pontiac division, several weeks ago, Oakland machinery was also removed temporarily to allow the laying of new floors and concrete bases. Much of the machinery was rebuilt and large quantities of new machinery were purchased and installed. An engine conveyor assembly line of the type used in the Pontiac factory was constructed with new block test facilities, overhead conveyor systems and new lighting. The changes involved the movement of 775 machines and was accomplished in two weeks time.

Slow Retail Sales Check Tire Output

Better Touring Conditions Seen Restoring Demand—Makers Decry Price Change

AKRON, June 20—Sales of automobile tires during May and early June have not been quite up to previous expectations, owing to cool and unseasonable weather retarding motoring in many sections of the country. This check to retail tire business has caused a recession in production of rubber companies.

Operations of most of the Akron tire manufacturers are still close to capacity, and a few weeks of hot weather undoubtedly would see a substantial increase in orders. Current output of casings in the Akron district is more than 140,000 a day.

Goodyear Tire & Rubber Co. production in Akron is around 45,000 tires, compared with a recent high mark of 47,000 to 48,000, it is unofficially reported. Factories in Canada and California probably are manufacturing about 10,000 more.

Output of tires at the Firestone Tire & Rubber Co. plant here is close to 45,000. The company will have a capacity of approximately 50,000 casings a day, with completion in the near future of the large five-story addition.

The B. F. Goodrich Co. is doing the greatest tire business in its history, sales to date this year having been about 50 per cent above last year.

Production of tires at the Miller Rubber Co. plant is picking up again, after showing a slight decline last month. General, Seiberling, Mohawk and India report capacity operations.

Manufacturers say there is no justification for a tire price decrease at present, despite the recent drop of about 6 cents a pound in crude rubber cost. They point out that this cheaper rubber will not be made up into tires for the next two or three months, and that even before the rubber price decline it was thought tires were selling at low prices in comparison with cost of raw materials and labor.

Some authorities believe crude rubber prices will be stabilized now for some time around the 35 cents a pound level. Eventually a further decline might be seen, they say, if the British government sees fit to scrap the restriction scheme. Such action by Great Britain seems likely in view of the growing unpopularity of restriction in that country and among rubber growers in its colonial possessions.

Sears Opens Boston Store

BOSTON, June 18—Sears, Roebuck & Co. has taken on the lease of the building just vacated by Star and Flint, and will open a retail store for automotive accessories, tires and camping equipment.

Tire Inventories Show General Rise

Excess of Production Over Shipments Brings Seasonal Increase in Stocks

NEW YORK, June 18—In line with the seasonal trend, production of casings and tubes in April exceeded shipments, resulting in a gain of inventories which, however, remain under the level of a year ago, according to the figures of the Rubber Association of America, Inc.

Comparisons follow:

	Inventory	Production	Shipments
Pneumatic Casings—All Types			
April, 1926 ..	9,345,694	4,009,299	3,735,126
March, 1927 .	8,687,312	4,707,672	4,276,107
April, 1927 ..	9,091,787	4,724,748	4,276,464
Inner Tubes—All Types			
April, 1926 ..	15,505,439	4,915,638	3,787,938
March, 1927 .	12,822,004	5,388,312	4,618,365
April, 1927 ..	13,351,406	5,529,936	4,769,385
Balloon Casings			
April, 1926 ..	2,831,328	2,111,056	1,919,060
March, 1927 .	3,500,757	2,709,647	2,440,651
April, 1927 ..	3,794,709	2,741,841	2,417,926
Balloon Inner Tubes			
April, 1926 ..	3,875,828	2,620,937	2,002,765
March, 1927 .	4,706,834	3,081,618	2,546,176
April, 1927 ..	5,302,394	3,131,335	2,492,473
High Pressure Cord Casings			
April, 1926 ..	5,187,115	1,597,394	1,622,690
March, 1927 .	4,534,254	1,920,170	1,746,474
April, 1927 ..	4,674,295	1,923,402	1,773,314
High Pressure Inner Tubes			
April, 1926 ..	11,629,673	2,293,701	1,785,173
March, 1927 .	8,115,170	2,306,694	2,072,189
April, 1927 ..	8,949,012	2,398,601	2,276,912

Toledo Steel Products Adds All-Steel Valves

TOLEDO, June 20—Toledo Steel Products Co. has brought out a new line of one-piece all-steel valves for passenger cars, supplementing the cast-head line which has become well established in the trade. Only the most popular numbers will be produced in the all-steel line for the present, the others being added as the demand increases.

The company's announcement says the material used in the new line is the highest grade steel obtainable and contains the correct proportion of elements to give heat-resisting and non-corrosive qualities.

Indiana Truck Sales Gain

MARION, IND., June 20—Indiana Truck Corp. reports an increase of 44 per cent in shipments for May as compared with shipments in the same month last year. The high May total followed heavy business in April which showed an increase of 78 per cent over April, 1926.

Czechs List Cars Luxuries

WASHINGTON, June 23—Automobiles and accessories have been placed on the luxury list for taxation purposes by the Czechoslovakian government, according to cable just received by the U. S. Department of Commerce. The original list contained 209 items and this has been reduced to 70 items, all of which are subject to a 12 per cent luxury tax, which includes a turnover tax.

The automotive items in the group include passenger automobiles having a cylinder content of more than 2.5 liters, bodies for such automobiles, solid tires, pneumatic tires and tubes, motorcycles and side cars for motorcycles. The tax became effective May 1.

$10,000,000 Air Line Forming on Coast

LOS ANGELES, June 20—J. L. Maddux, Los Angeles Lincoln dealer, has announced that plans are rapidly nearing completion in this city for the establishment of a $10,000,000 air line, carrying passengers and freight, between Los Angeles, San Francisco and other coast points. The service, it is declared, will later extend to St. Louis and very probably to Mexico City and other Mexican points.

The first plane which is to be delivered at an early date by the Ford Motor Co. is a triple-engined, all-metal 12-passenger craft. Edsel Ford, it is said, will either be a passenger in it or will be in this city on its arrival about July 12.

Ford Plans Larger Plane

DETROIT, June 18—Ford Motor Co. is planning a 20-passenger all-steel airplane, according to William B. Mayo, chief engineer. The new type of plane would be approximately twice the size of the present type now manufactured, which has capacity for 10 passengers.

Aircraft Exports Seen Aided by Ocean Flights

WASHINGTON, June 24—Exports of aircraft and parts, excluding tires, from the United States during the first four months of this year totaled $444,113, compared with $253,352 in 1926, an increase of 75 per cent. A view is expressed by the automotive division of the U. S. Department of Commerce, making public the figure, that the two recent Atlantic ocean flights will greatly stimulate such purchases during the next four months period.

S. B. Chamberlain

SPRINGFIELD, MASS., June 18—Word has been received here of the death of Stanley B. Chamberlain, in charge of the Singapore office of the Fisk Rubber Co. He had been in the company's employ 14 years. He was to have sailed June 30 for this country on a six months' leave of absence. Heart disease is given as the cause of his death. He leaves a widow and one son, who were with him in Singapore, and his parents, who live in West Springfield.

Improved Refining Meets Oil Deficit

Bureau of Mines Shows Car Building Outstripping Oil Production

WASHINGTON, June 23—The efforts and success of the oil refining and producing industry to keep available a supply of gasoline to meet the demands of the millions of automobiles of the United States are outlined in a statement released here this week by the U. S. Bureau of Mines. Some idea of the strides made is obtained by the fact that while the use of automobiles has increased six times since 1916, the production of crude oil has increased but three times. In other words automobiles are being built twice as fast as gasoline is being produced, and the deficit in production has been taken care of by increased refining facilities coupled with improvements made by the automobile industry in engine construction, the bureau says.

Some figures from the report show that 85 per cent of the gasoline is used by automobiles. The percentage of recovery of gasoline from crude oil in 1916 was 19.8 per cent. In 1925 the percentage was 35.1. Despite efforts of the oil industry, however, to keep abreast of the automobile manufacturing industry in production, the former is losing ground to the automobile makers. The figures show that the gain in car registration during the past 10 years has been 468 per cent while the gain in gasoline production has been 460 per cent.

One Vote Shortage Kills Illinois Gasoline Tax

CHICAGO, June 18—The Illinois gasoline tax bill which was backed by the state administration was defeated by one vote in the Senate yesterday after it had been passed by the House. The vote was 25 for and 22 against, but it required 26 votes for passage. Several senators did not vote. This action keeps Illinois as one of the four remaining states that do not have a gasoline tax.

The defeat of the bill is considered a great victory for the organized automotive trade and motorists of Illinois. The Illinois Automotive Trade Association, the Chicago Automobile Trade Association, and the Chicago Motor Club have conducted a vigorous campaign against the measure and even after the bill had passed the House and was slated by the administration for immediate passage in the Senate, these organizations did not give up. As a result of their activities petitions and protests poured into the legislature by mail and wire in such volume that for the first time in many years the administration was defeated in a major fight.

Air Line to Join New York-Chicago

New Company Will Operate Five Bellanca Planes—Miami Line Planned

NEW YORK, June 22—A new passenger air line between New York and Chicago will be inaugurated within four months by a new company headed by A. R. Martine, of the Bankers Service Co., this city. A second line to Miami is to be opened later. The company will be incorporated this week. Contract for five planes to be used in opening the line has been placed with G. M. Bellanca, designer of the plane in which Chamberlin recently flew to Germany.

To Locate New Factory

The contract was the first received by Mr. Bellanca since severing his relations with C. A. Levine. His new company, the Bellanca Aircraft Corp. of America, will serve purely as a manufacturing enterprise insofar as this new New York-Chicago company is concerned. The Bellanca company is soon to locate a new factory, three sites for which are under consideration. The contract price for the New York-Chicago planes is $28,500 each.

Planes used by this company will be of the "sesqui" type, with a Wright Whirlwind engine in the nose and two engines of lesser power in the wings. Twelve passengers will be carried, allowing 160 lb. each and 25 lb. for baggage. The crew will be two men, the pilot navigator and a steward, the latter serving meals and attending to the comfort of the passengers generally. Each ship will carry 200 gal. of gasoline as maximum fuel load and will have a cruising speed of 100 miles an hour, the flight time being set at about seven and one-half hours. Flying time from New York to Miami is expected to be 10 hours each way.

See Losses for Time

Mr. Martine expressed confidence as to the prospects for the company but said it was prepared to operate at a loss for a considerable length of time. "I do not look for the overnight growth of aerial transportation here," he said. "It takes more than a month or two to educate the public to a new mode of travel. If a line is founded on a sound basis and shows by continuous operation on a fixed schedule that it can be depended on it will draw sufficient patronage to pay.

"In two years' time I prophesy we shall have an hourly service to Chicago. But as yet I don't even know how many trips we will make in a week or a day. I want to make as many trips daily as can be made with five planes. We have got to build them and put them into operation before we know how many that is. I expect to have at least one trip a day each way to begin with. The fare will be a little below one and one-half times the railway fare."

Mr. Martine declared that the company expected to put many more planes into operation after the first five have been constructed, but said five was all Mr. Bellanca would promise to build on short order. Others would be obtained when the line got under way.

Peach Men Try Trucks to Reduce Rail Losses

DURHAM, N. C., June 21—Peach growers of the sandhill section of North Carolina are experimenting with trucks in the transportation of peaches to northern markets. Heretofore the peaches have been shipped exclusively by rail, several thousand car loads each season. While the method has been fairly satisfactory, the loss from delay at junction points, broken crates, etc., has been high.

Growers and packers who have been experimenting this year with trucks say that they can get quicker and safer delivery this way and that there is very little difference in the cost. New York is about two days by truck from the orchards. Growers say if the experiment stands up through this season that all peach growers will use trucks next year for their Washington, Baltimore, Philadelphia and New York shipments.

Seek Sale of Auto Body

DETRIOT, June 21—At a meeting of the secured creditors of the defunct Auto Body Co., Lansing, with the directors of the Hayes-Ionia Co. consideration was given to the possibility of a deal being effected for sale of the Lansing plant to the Grand Rapids interests.

AC Starts Office Unit

DETROIT, June 21—The AC Spark Plug Co. has broken ground for a new office building, at Flint. The structure will be 207 by 63 feet and will contain 52,000 sq. ft. of floor space. Erection of the building will release space now occupied by offices for manufacturing purposes.

Warner Says Cities Should Back Flying

Real Progress to Come Through Study of Commercial Possibilities

BOSTON, June 18—"The air as a commercial carrier is sure to be a well-established fact within a few years," said Edward P. Warner, assistant secretary of the Navy in charge of aeronautics, addressing the Boston Rotary Club this week. "American commercial air service is increasing constantly. The number of routes is being enlarged. Many cities that now have no airports are making plans to build them. Big cities should spend more time planning how the airplane could best be used commercially. Only by combined effort can any real progress be made along these lines. With Naval aviation it is necessary to land on sea and ground, and to aid this dual operation it is necessary to have bases ashore. Through these land bases commercial aviation can get its chances to coordinate with the government."

Jordan Adds "Blue Boy"

CLEVELAND, June 22—Jordan Motor Car Co. has added a four-passenger touring car, called the Blue Boy, to the Little Custom Jordan line, and shipments are now going forward to dealers. The new car lists at $1,745. Body and fenders are finished in blue, with wheels and body striping in orange. Windshield supports, radiator and other fittings are trimmed in nickel. A folding tonneau windshield is provided. Other equipment includes extra wire wheel and tire and front and rear bumpers. Upholstery is in dark blue morocco leather.

Midland Profits Gain

DETROIT, June 21—Midland Steel Products Co. showed net profits for May, after all charges except Federal taxes and profit sharing, of $289,578 compared with $256,909 in April and with $271,757 in May, 1926.

Lycoming Once Made Cup Vending Machine, Velie First Car Manufacturer Customer

WILLIAMSPORT, June 20—Addressing members of a local civic club, John H. McCormick, general manager of the Lycoming Mfg. Co., reviewed the history of the company, pointing out that things weren't always as good for the company as they are today.

For a long time previous to beginning the manufacture of automobile engines, the company sought a profitable field of operations. Operating as a sort of job shop it built "everything under the sun," even a drinking cup vending machine. In the first five years it was paid for only about one-third of the articles made.

This sort of thing wasn't conducive to bodily ease.

While two members of the organization were at French Lick for their health they were approached as to the possibility of the company manufacturing automobile engines. Following this up a contract was closed with Velie for 1000 engines. On the first 500 the company lost $32,000 and broke even on the second. From then on it was a money-making proposition, the company gradually developing to its present high position.

Reo to Continue 300 Daily Output

Shipments for Year to Reach 40,000 — Will Add Two Wolverine Models

LANSING, June 23—Reo Motor Car Co. will introduce two new body models in the Wolverine line late in the summer, the new models to be a two-passenger coupe and a five-passenger sedan.

Officials of the company look for production to maintain an average of 250 to 300 cars daily for the balance of the year, with an increase to 400 daily in the spring of 1928. Shipments in the fiscal year ending August 31 next, are expected to exceed 40,000 which will compare with 35,000 in the 1926 fiscal year. Production in the 1928 year is expected to increase to 75,000 with a ratio of three passenger cars to one commercial car.

Packard Production Runs 50% Ahead of Last Year

DETROIT, June 21—According to Alvan Macauley, president, Packard Motor Car Co. is looking forward to record-breaking business during the summer and fall. Packard's financial position is very satisfactory, he stated, declaring that the company now has cash totaling approximately $16,000,000. Current assets are about $21,000,000 compared with current liabilities of $6,400,000. Approximately $8,000,000 has been spent, this year, on plant improvements and extensions. Production to date this year is about 50 per cent ahead of last year.

N.A.C.C. Advertising Men Hold Meeting in Detroit

DETROIT, June 23—The Advertising Managers Meeting of the National Automobile Chamber of Commerce here this week, was addressed by H. H. Rice, chairman of the taxation committee of the chamber, on the place of advertising in the public affairs of the nation. Lockwood Barr, publicity director of General Motors Corp., spoke on "Why Publicity." George E. Piper, *The Household Magazine*, talked on "Is It Profitable to Buy Duplicate Circulation?" Edward S. Jordan, president of Jordan Motor Car Co., was chairman of the meeting. The meeting will close tomorrow with an inspection of the General Motors proving ground, where the advertising men will be guests of the corporation.

Charlotte Considers Race

CHARLOTTE, N. C., June 21—Decision whether to hold automobile races at the Charlotte speedway in the future will be made within three weeks, it is announced by Lee Folger, a member of the syndicate that bid in the property at auction sale, and Charlotte representative of the American Automobile Association. The new owners of the bowl, who, besides Mr. Folger, are C. C. Coddington and B. D. Heath, are willing and anxious to hold races if the people want them, Mr. Folger says. In the event decision is made to hold races in the future the next one will be put on in October.

Impersonating a Prospect Disastrous These Days

SALT LAKE CITY, June 18—A month in the city jail was the penalty imposed by the city judge yesterday upon a man 32 years of age and giving the name of R. E. Palmer, who was charged with obtaining free transportation to several Utah cities and towns by falsely representing himself to be a prospective automobile purchaser. After a short demonstration he would tell the confiding salesman that he had a friend in a certain city or town from whom he could get the money if he were driven there. Each time the stranger, the evidence showed, "failed to locate his friend." Vagrancy appeared to be the only charge that the police could bring against the man for such an offense, and they pressed that.

Tire Repair Organization Formed in Switzerland

WASHINGTON, June 23—A syndicate or association of the automobile tire repairing concerns in Switzerland has just been organized, according to report made by the American consul at Zurich to the U. S. Department of Commerce. The association is to be known as the "Verband Schweizerischer Neugummirungsanstalten" and begins with 20 concerns as members.

It is estimated that 40,000 to 50,000 used tires are prematurely discarded annually in Switzerland, of which approximately 33 per cent can be repaired and made fit for use again. The consul suggests that the organization affords an opportunity for American tire accessory sales in that country.

New Jersey Sales Lower

NEW YORK, June 21—New passenger car sales in New Jersey last month totaled 11,002 comparing with 12,299 in April and 12,955 in May, 1926, according to Sherlock & Arnold's figures. The same report shows that new commercial vehicle sales in New Jersey in May were 1559 against 2141 in May, 1926. Proportionately the largest loss was suffered in the heavy duty field.

Isherwood Visits Trade

FLINT, June 20—W. S. Isherwood, sales manager of the AC Spark Plug Co., attending the Automotive Equipment Association annual meeting, will remain in the West until July 23, and will visit the new district sales offices recently established at San Francisco and Kansas City, besides calling on the distributing trade in that section.

Financial Notes

Moon Motor Car Co. and subsidiaries report for year ended Dec. 31, 1926, net loss of $498,638 after interest, depreciation, inventory adjustments, etc., comparing with net income of $1,102,828 or $6.12 a share on 180,000 shares of no par stock in 1925. The consolidated balance sheet as of Dec. 31, 1926, shows net current assets, including cash $113,856, totaling $2,103,987, against net current liabilities of $1,384,128. The loss of the company last year is more than accounted for by extraordinary deductions of $624,060, consisting of $79,480 reduction of inventories and $544,580 charges for liquidating subsidiary selling companies.

General Motors Acceptance Corp. has filed application to increase its capital stock from $25,000,000 to $35,000,000 through sale of 100,000 shares of its stock to General Motors Corp. at a premium price of $125 a share. The application is subject to approval by the New York Superintendent of Banks. Total capital surplus and undivided profits will exceed $50,000,000 when this new financing is completed.

Borg & Beck Co. reports May net income $102,287 after taxes and charges, comparing with $94,320 in April. Net income for the first five months of 1927 amounted to $420,839, equal to $3.58 a share (par $10) earned on outstanding 171,600 shares of stock, compared with $382,870, or $3.06 a share, on 125,000 shares outstanding in first five months of 1926.

Hood Rubber Co. passed the regular quarterly dividend of $1 a share on the common stock. This is the first break in the common stock dividend record which goes back to 1898. A stock dividend of 25 per cent was paid last fall. During the post-war deflation period the company was the only big rubber manufacturer to maintain common stock dividends.

Indian Motorcycle Co. has declared a special dividend of 50 cents a share on common stock, payable July 1, in addition to the regular quarterly dividend of 1¾ per cent on preferred. A similar dividend was paid on common stock March 1. Plant operations are reported as continuing on the improved basis obtaining for the last several months.

Bohn Aluminum & Brass Co. earned $324,237 after all charges and taxes in the quarter ended March 31, 1927, equal to 93 cents a share on 347,684 shares of no par stock.

Hoover Steel Ball Co. has declared a three per cent cash dividend payable July 1 to stock of record June 25.

Servis Takes New Post

TRENTON, N. J., June 20—Frank W. Servis, secretary of Combination Rubber Co., has resigned and is now affiliated with Colvin & Servis, rubber manufacturers of Rahway, N. J. The concern was recently chartered with $125,000 capital.

Ray H. Paddock, general sales manager of the Murray Rubber Co., has resigned and has become affiliated with a New York tire concern.

Tyree Fixes Terms for Reorganization

BLOOMINGTON, ILL., June 18—Agreement between creditors and the stockholders' committee of Tyree Auto Radiator Co. reached this week, provides for issuance of 5 per cent notes to creditors to cover the amount of their claims, which automatically extend as long as interest payments are made; a $35,000 loan upon real estate and buildings of the company to pay preferred claims and realizing warehouse receipts to supply necessary materials for manufacture of the Tyree products, and a working capital fund, raised by stockholders, of at least $16,000 and not in excess of $20,000.

The stockholders have agreed to place at least 51 per cent of stock in hands of the creditors' committee to remain there during the life of the agreement. C. E. Amond, F. H. Walworth and E. K. Richmond, of the creditors' committee, have been made directors of the company. F. M. Young, formerly vice-president of the Racine Auto Radiator Co., scheduled to be manager, but who was unable to obtain a release from the Racine concern, is slated to be another member of the board. D. W. Lake, manager of the Chicago plant recently closed, will become active manager.

Sell Planes on Instalments

WASHINGTON, June 22—The selling of airplanes on an instalment basis has been introduced in England as a means of popularizing their use and as a practical method of permitting the business man of moderate means of owning a plane, the Automotive Division of the U. S. Department of Commerce is advised by the American Consul at London. The firm of William Whiteley, Ltd., London, are advertising for sale, on the instalment plan, De Haviland "Moths," 60 hp. sport planes.

Detroit Banks Carry Car Exports Paper

DETROIT, June 18—A cargo consisting mostly of automobiles in crates was aboard the Diesel-electric freighter, Twin Cities, which cleared Detroit, yesterday, for New York. A new feature which was inaugurated, and which will be continued, was that all consignments were on manifests by which Detroit shippers export on the same basis as New York houses, the paper being handled by Detroit banks. This new line of business, it is predicted, will lead to the installation by Detroit banks, of foreign trade departments.

National Bearing Metals Merges Six Producers

PITTSBURGH, June 20—The National Bearing Metals Corp. has been formed here with a capitalization of $8,300,000 through the merger of six metal companies. The companies included in the consolidation are Damascus Bronze Co. and the Keystone Bronze Co., Pittsburgh; More-Jones Brass & Metal Co., St. Louis; Bronze Metal Co., New York; Southern Brass Works, Plymouth, Va.; and the Brady Brass Co., Jersey City, N. J.

John B. Stauch, St. Louis, was named president, and Alexander Turner, New York, chairman.

Erskines Win Gold Medals

NEW YORK, June 20—Word has been received here of the awarding of gold medals to two Erskine sedans in the twentieth annual London-Edinburgh reliability run just completed.

Japanese to Repeat Car Show at Tokyo

WASHINGTON, June 18—The first Japanese automobile show, held in Tokyo recently, was so successful that plans are being made for a second exhibition this fall, the U. S. Department of Commerce was informed this week.

The first show included displays of the Nash, Fiat, Renault, Clyno, Rolls-Royce, Lincoln, Ford, Citroen, Chevrolet, Star, Otomo, Dodge, Moon, Diana, Paige, Packard, Wolseley, Hupmobile, Chrysler, Buick, Cadillac, Auburn and the White bus and truck chassis. Motorcycle exhibits included the Harley-Davidson, Sunbeam, Indian, B.S.A., Ace and A.J.S.

The miscellaneous exhibits included Firestone, Goodyear and Dunlop tires; products of the Standard Oil and Rising Sun companies; various American accessories, and a special exhibition by the Japanese Army, including a tank, a caterpillar type passenger car made by Renault and Wolseley trucks and buses.

Chrysler Speeds 89.091 m.p.h.

ATLANTIC CITY, June 20—A record for American stock cars of the 300 cu. in. piston displacement class was set up by a Chrysler Imperial sport roadster driven by Ralph DePalma when it travelled 89.091 miles in one hour on the speedway here. The test was made under supervision of the American Automobile Association.

Marmon Shows Gain in May

INDIANAPOLIS, June 20—Retail sales of Marmon cars in May were well in advance of April shipments and orders on the books of the company indicate that the peak of the season will not be reached until well into the summer.

Calendar of Coming Events

SHOWS

Chicago .....Nov. 7-12
Exposition, Coliseum, Automotive Equipment Association.

Chicago .....Jan. 28-Feb. 4
National, Coliseum, National Automobile Chamber of Commerce, including special Shop Equipment Exhibit.

Chicago .....Jan. 28-Feb. 4
Automobile Salon, Hotel Drake.

Cleveland .....Sept. 19-23
Exposition, Public Auditorium, National Machine Tool Builders' Ass'n.

Cleveland .....Oct. 3-7
Exhibition, Public Auditorium, American Electric Railway Ass'n.

Cleveland .....Nov. 14-19
Convention Hall, National Standard Parts Association.

Cleveland .....Jan. 9-14
American Road Builders Association.

London .....Oct. 14-22
Olympia Passenger Car Show.

London .....Nov. 17-26
Olympia Truck Show.

Los Angeles .....Feb. 11-18
Automobile Salon, Hotel Biltmore.

New Haven, Conn. .....Sept. 6-9
Machine Tool Exhibition.

New York .....Nov. 27-Dec. 3
Automobile Salon, Hotel Commodore.

New York .....Jan. 7-14
National, Grand Central Palace, National Automobile Chamber of Commerce, including special Shop Equipment Exhibit.

Paris .....Oct. 6-16
Grand Palais.

San Francisco .....Feb. 25-March 3
Automobile Salon, Hotel St. Francis.

CONVENTIONS

American Electric Railway Association, Public Auditorium, Cleveland..Oct. 3-7

American Society for Steel Treating, Convention Hall, Detroit....Sept. 19-24

Automotive Equipment Association Summer Convention, Multnomah Hotel, Portland, Ore...June 27-July 2

Automotive Equipment Association, Coliseum, Chicago .....Nov. 7-12

International Chamber of Commerce, Stockholm .....June 27-July 2

National Association of Automobile Show and Association Managers, Drake Hotel, Chicago .....July 28-29

National Safety Council, Stevens Hotel, Chicago .....Sept. 26-30

National Standard Parts Association, Hotel Hollenden, Cleveland..Nov. 14-19

S. A. E.
National

Chicago, November—National Transportation and Service Meeting.

Chicago, Dec. 1—Tractor Meeting.

Cleveland and Detroit, Sept. 19-22—Production Meeting.

Detroit, Jan. 24-27—Annual Meeting.

New York, Jan. 12—Annual Dinner.

RACES

Abilene, Texas .....July 4
Altoona, Pa. .....Sept. 5
Atlantic City .....Sept. 24
Belgian Grand Prix, Spa-Francorchamps .....July 9-10
British Grand Prix, Brooklands.....Oct. 1
Charlotte, N. C. .....Oct.
Detroit .....Sept. 10
French Grand Prix, Montlhery.....July 3
Los Angeles .....Nov. 27
Salem, N. H. .....June 25
Salem, N. H. .....Oct. 12
Syracuse, N. Y. .....Sept. 3

By Actual Test —

DRAINOIL PISTON RINGS

—with up-slanting slots do, by actual test, increase power, decrease oil consumption, give the utmost piston ring protection against carbonization and crankcase dilution. With Drainoil rings there is oil control **plus** positive lubrication. On down stroke of piston the upper edges of slots wipe surplus oil from cylinder wall and return it to crankcase, and on up stroke the oil remaining in slots is fed back to cylinder wall for proper lubrication.

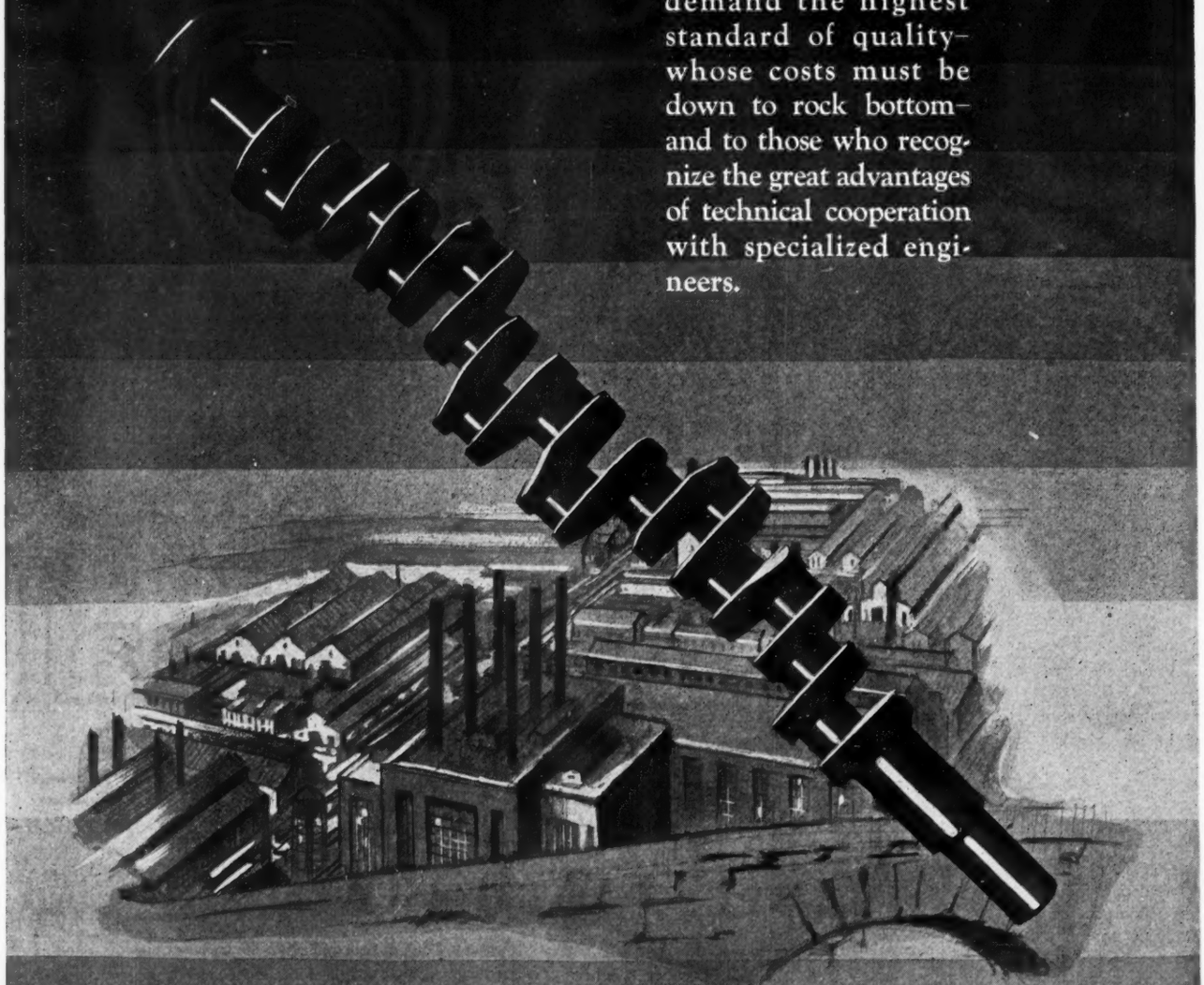
To be used in combination with Quality Plain Rings or No-Leak-O Oil Sealing Compression Rings.

The Piston Ring Company
Muskegon, Michigan

DRAINOIL • QUALITY - NO-LEAK-O

WYMAN-GORDON

The services of the Parts specialists have become essential to those who demand the highest standard of quality—whose costs must be down to rock bottom—and to those who recognize the great advantages of technical cooperation with specialized engineers.



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GUARANTEED FORGINGS
STANDARD OF THE INDUSTRY

WYMAN-GORDON
Worcester, Mass.
Harvey, Ill.

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The AUTOMOBILE

Reg. U. S. Pat. Off.
Established 1902

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Have You Looked in on

Udylite
RUST PROOFS

ALTHOUGH the Udylite Process has never been offered as a cure-all for every rust-proofing problem, its success under widely varying conditions in practically every modern industry has presented a constant series of surprises to its developers.

New applications, new opportunities and new advantages of this unusual process are daily discoveries, in the very busy laboratories of the Udylite Process Company. Suggested at first for a rather limited field, this master of rust-proofs has spread until the list of users has become a Blue Book of American industry.

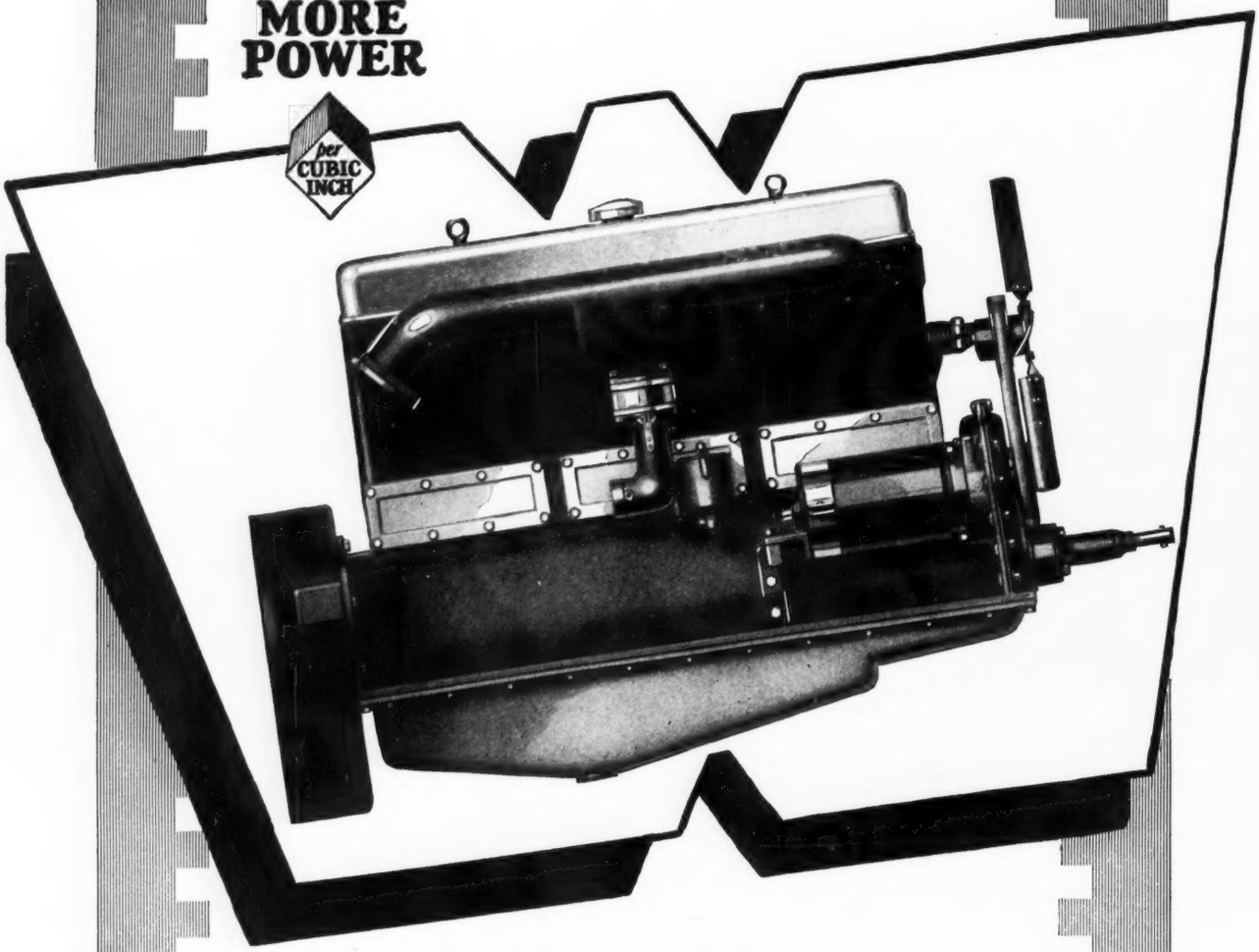
Udylite engineers are ready at any time to take up your rust-proofing problems and make an expert analysis of the situation. You may be sure that they will not suggest Udylite until they are convinced that it is the best for your particular requirements. Furthermore, only a complete test will convince them.

A conference with Udylite engineers does not entail any obligation, of course, and it can be arranged promptly at your request.

THE UDYLITE PROCESS COMPANY
KOKOMO INDIANA

Cadmium materials for Udyliting, of guaranteed quality and carefully tested, are available from the Udylite Process Company at prevailing market prices.

MORE POWER per CUBIC INCH



Overhead Valves

For many years Wisconsin engineers have specialized on overhead-valve motor design. They knew it was superior in theory—and they have proved it superior in practice.

To the overhead-valve principle is largely due the surpassing performance of Wisconsin Motors —their famous "More Power per Cubic Inch"— their notable economy of fuel and oil—their long life and low service costs.

WISCONSIN MOTOR MFG. CO.
Milwaukee, Wisconsin

Wisconsin Motors—Four or Six—20-horse to 120—will do a better job for you than any comparable motors—whether you power with them a truck, bus, tractor or construction machine and we stand ready to prove it. May we send you the facts and figures?

Wisconsin CONSISTENT

NOW, as never before, outstanding car performance is resulting in outstanding sales successes. More and more automobile manufacturers are finding that Schebler Carburetors give them better car performance — car performance which increases their sales.

SCHEBLER
The World's Finest CARBURETORS
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WHEELER-SCHEBLER CARBURETOR COMPANY
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America's Oldest Exclusive Carburetor Manufacturer

Speed without Strain

What clutch has withstood the exacting demands of today's motorized traffic? Borg & Beck has proved its superiority by the way it handles the superpower developed in the new sixes and eights.

Quick getaway in traffic, ease of operation and speed without strain. These are the salient features of Borg & Beck clutches.

THE BORG & BECK COMPANY

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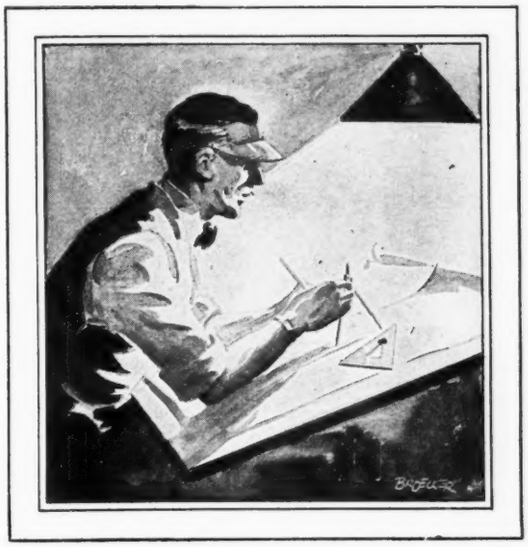

Designing—
Hyatt Quiet Bearings are mathematically correct before their physical formation is begun.

That the Automotive Industry may *Progress and Prosper!*

To make a bearing of superior quality and quietness; to maintain that excellence always; to hold its product available for the continued betterment of the automotive industry—that is the Hyatt principle.

Even now, after thirty-six years of successful experience, Hyatt's knowledge of metals and of methods is increasing. Constant research and contact with the master minds of the industry yield constant improvements that anticipate new conditions and new requirements.

Thus Hyatt assumes the dual role of counselor and guardian of quality—that the automotive industry may progress and prosper.

The finest quality steel is made more useful for bearing purposes by special heat treating formulas.

Every manufacturing step is checked by the finest and most accurate gauges.

Frequent conferences of technical experts and practical workmen safeguard quality and efficiency.

HYATT ROLLER BEARING COMPANY
NEWARK · DETROIT · CHICAGO · PITTSBURGH
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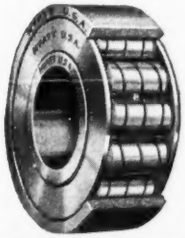
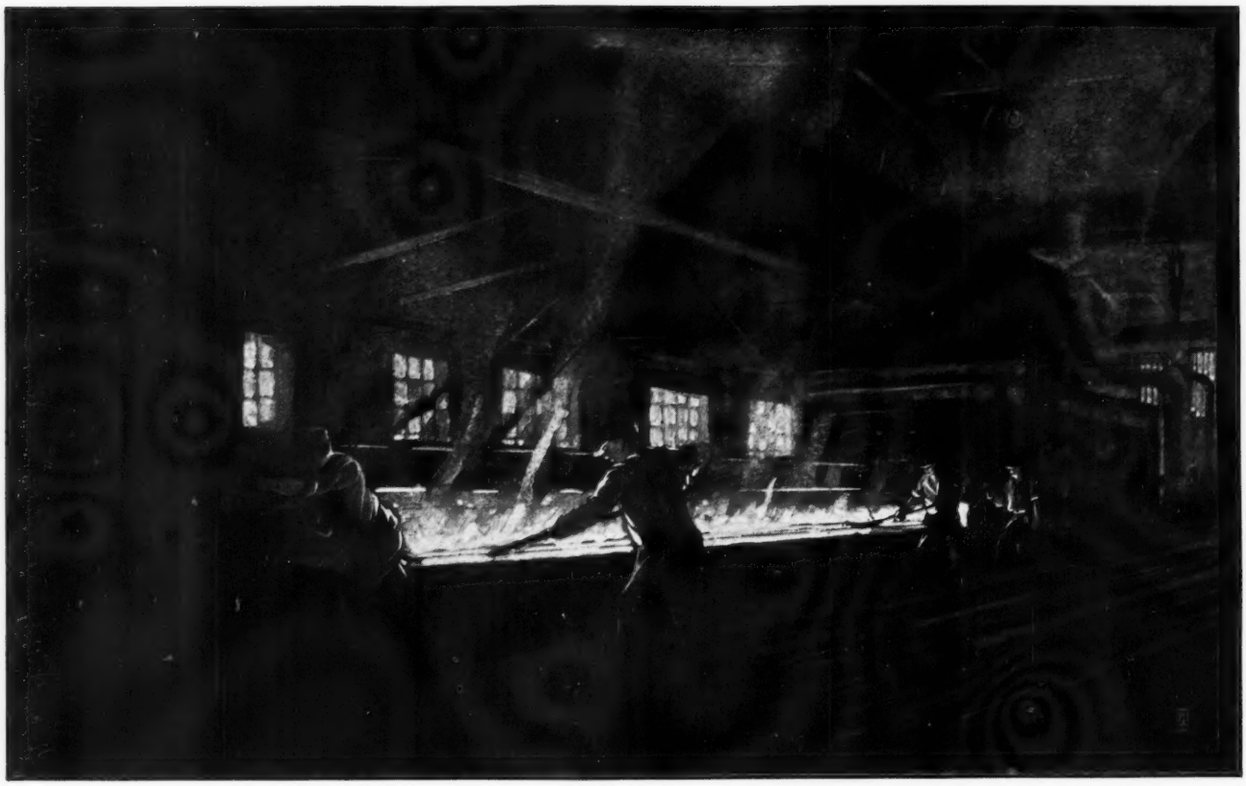


HYATT
QUIET ROLLER BEARINGS



Heat-treated stampings up to forty feet long

You know of the famous Parish heat-treated Frames used by American Car & Foundry, American La France, Fageol, Indiana, Pierce-Arrow, White, Autocar, Stewart, Brockway and others . . .

These manufacturers once had frame problems. Parish knowledge of heat-treating and Parish heat-treating facilities solved them.

Anything up to forty feet long may be heat-treated at the Parish plant. Big truck and bus frames. Small, intricate brackets, Parish alone is so equipped.

Have you a difficult stamping problem? Do you seek lighter weight, yet greater strength? Is stamping breakage high? Or, are you pioneering in cost-cutting?

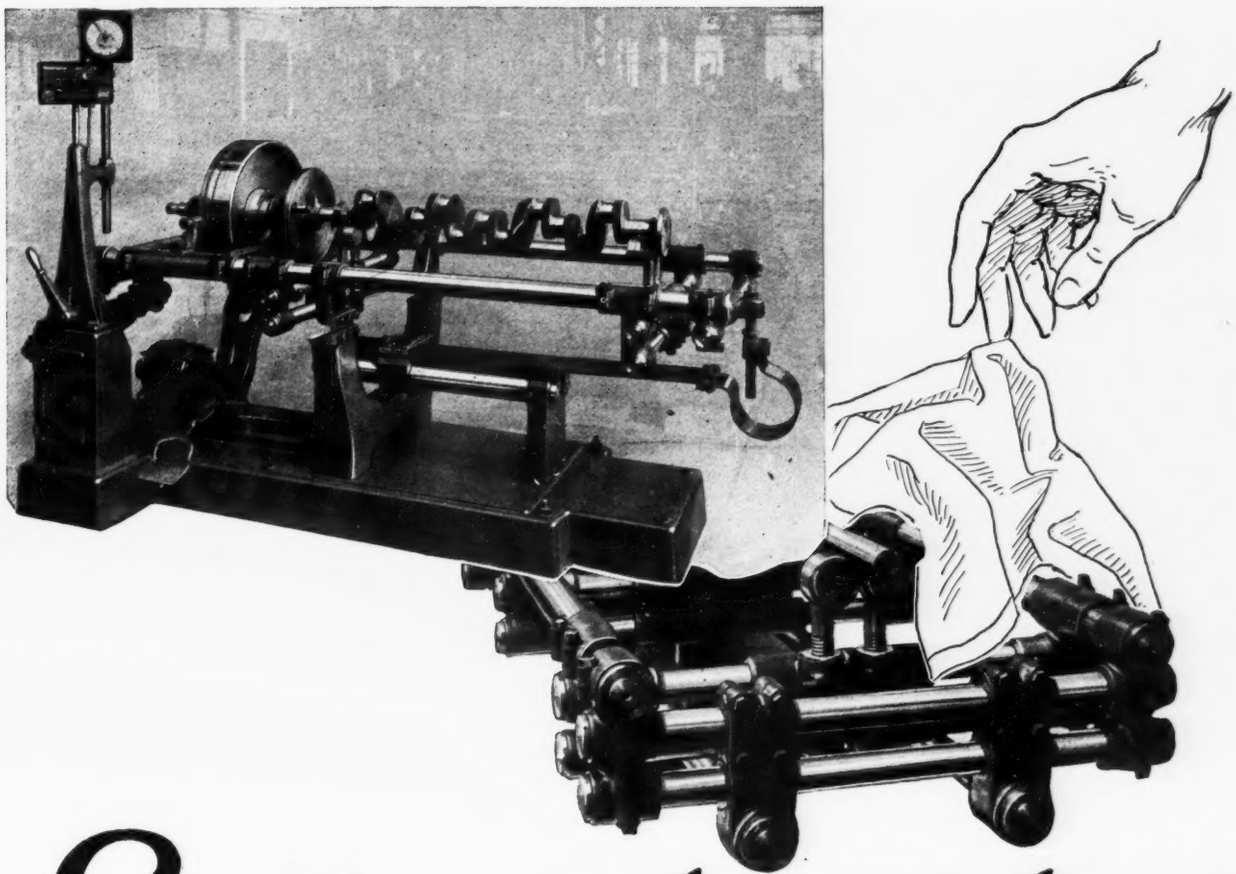
PARISH
HEAT TREATED
FRAMES
THE BACKBONE OF THE CHASSIS

Turn Parish loose on your problem for quick, efficient results.

Parish Pressed Steel Co.
Reading, Pa.

PARISH

for steel stampings and heat treated frames



Sensitive to the weight of a handkerchief ~ ~ ~

To test the sensitiveness of the Gisholt Precision Balancing Machine (which weighs more than a ton) a handkerchief was dropped on one end of one of these machines. The recording amplimeter showed a disturbance of 2½ divisions.

Not only does the Precision Balancing Machine record the most minute amount of unbalance, but it also clearly indicates where a correction should be made to remove the unbalance. It works with the exactness of a set of jeweler's scales and with the accuracy of the best "mike."

THE PRECISION BALANCING MACHINE

If you have balancing of any kind an investigation of the Gisholt Method of Balancing will prove to be very interesting to you and undoubtedly profitable.

Our Treatise "Dynamic Balancing Simplified" explains the Gisholt Method of Balancing and we will be glad to send you a copy at your request.

Gisholt Machine Co.
Madison, Wisconsin, U. S. A.

The PRECISION Balancing Machine

That Extra Per Cent!

Said a Wise Man—

There is only a small per cent of difference between the good man and his superior.

The same can be said of Arbors. The K&T Arbors for milling machines have that extra per cent—that difference which sets them above the "just as good".

These Arbors are made with the same extreme precision that has earned recognition for Kearney & Trecker Milling Machines and established them as the standard of comparison.

That extra per cent results from high quality chrome nickel forgings finished to ten thousandths accuracy—not thousandths. New processes toughen and harden K & T Arbors to withstand both wear and impact. Collars too are of extreme precision and collar faces *are* parallel.

The man at the machine will appreciate that extra per cent when he sets his gauges to the work. Test one in your own way—on your own work on heavy cuts or fine high speed work.

They fit any milling machine from 2 to 25 horsepower having the New Standarized Spindle End.

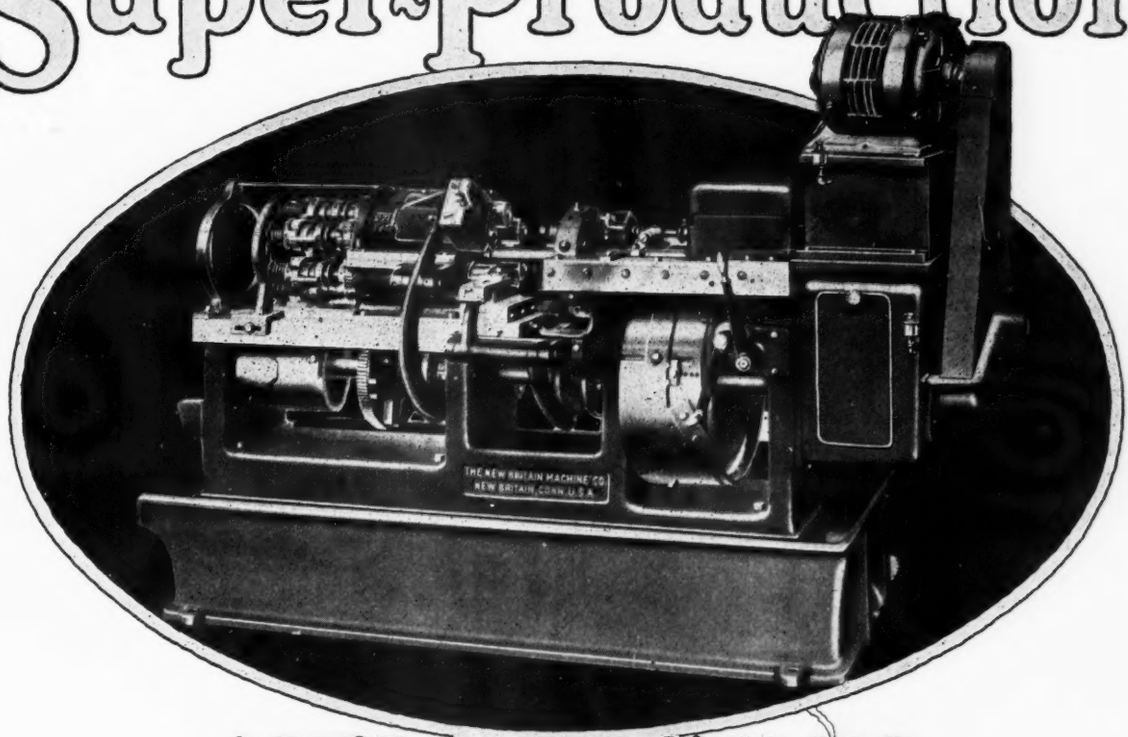
a K & T Arbor on Your Milling Machine will make a Better Machine Tool of it.

MILWAUKEE MILLING MACHINES

KEARNEY & TRECKER

MAIN OFFICE AND WORKS: MILWAUKEE, WISCONSIN

Super-Production



NEW BRITAIN AUTOMATIC SCREW MACHINES

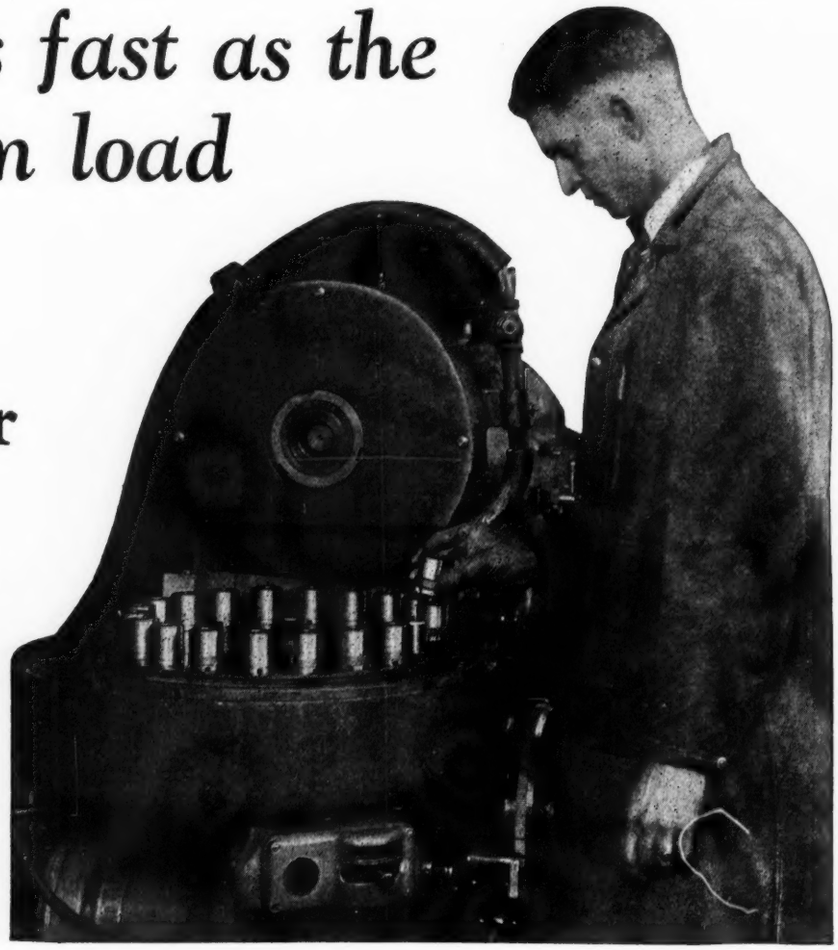
The record of achievement in decreasing the production cost of high grade parts by New Britain Super-Production Screw and Chucking Machines is especially noteworthy in the automotive field.

Bulletins of complete line of screw and chucking machines mailed on request.

THE NEW BRITAIN MACHINE CO.
New Britain, Conn.

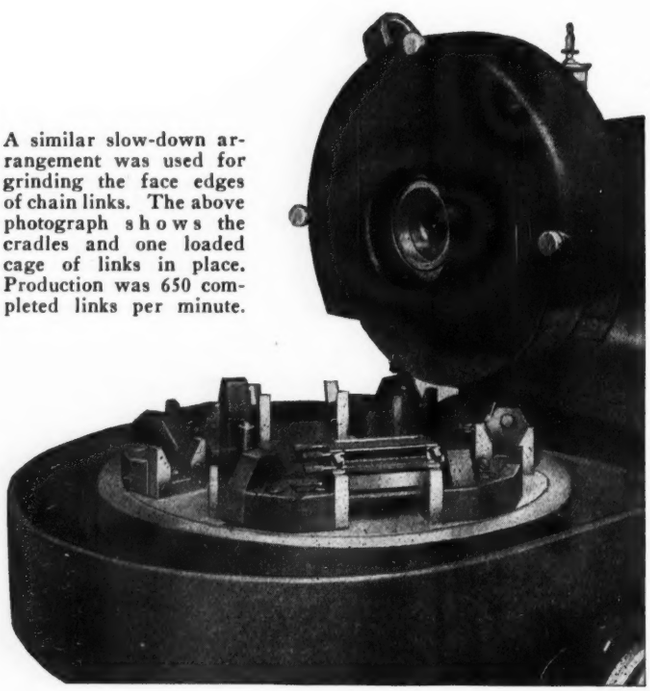
Grinding as fast as the operator can load

About 2400 per hour



Continuous Rotary Surface Grinding can be accomplished on many jobs with the Heald Style No. 25. With a slow-down arrangement for the chuck and a wide wheel that reciprocates slightly, the work is ground as it passes under the wheel, can then be removed and a new piece loaded while the chuck is in motion—thus making it a matter of loading and not grinding that limits production.

With the chuck turning at the rate of two revolutions per minute, a suitable fixture for holding the work, and where the stock to be removed is fairly uniform, 2400 pieces, as shown, can be ground per hour.



A similar slow-down arrangement was used for grinding the face edges of chain links. The above photograph shows the cradles and one loaded cage of links in place. Production was 650 completed links per minute.

This method of surface grinding gives an exceptionally high production and at the same time, an excellent finish, as the periphery of the wheel is used in grinding. If you have work that could be handled in the above manner, send in samples and let us estimate what production can be obtained.

No obligation.

The Heald Machine Co.
Worcester, Mass

One Source *All* Wheels

Every model in the line can have the engineering, style, and prestige of wheels by Motor Wheel. ¶Every preference of the designer or buyer can be met, through this one source, without complicated changes on the axles, hubs, or spare mounting device. ¶Motor Wheel first made steel wheels completely practical. Motor Wheel first made demountable rims practical on steel wheels. Now the same resources and resourcefulness make it possible to offer virtually unrestricted wheel option, without drawbacks in assembly, delivery or service. ¶Staying ahead of the Industry's manufacturing and sales requirements, Motor Wheel stays far ahead of all other wheel makers, by every reckoning.

MOTOR WHEEL CORPORATION, Lansing, Michigan

Motor Wheel

Close view of Direct-drive clutch and side-trimming Gear Shaper cutter

An Opportunity for Greater Profits and A Better Transmission

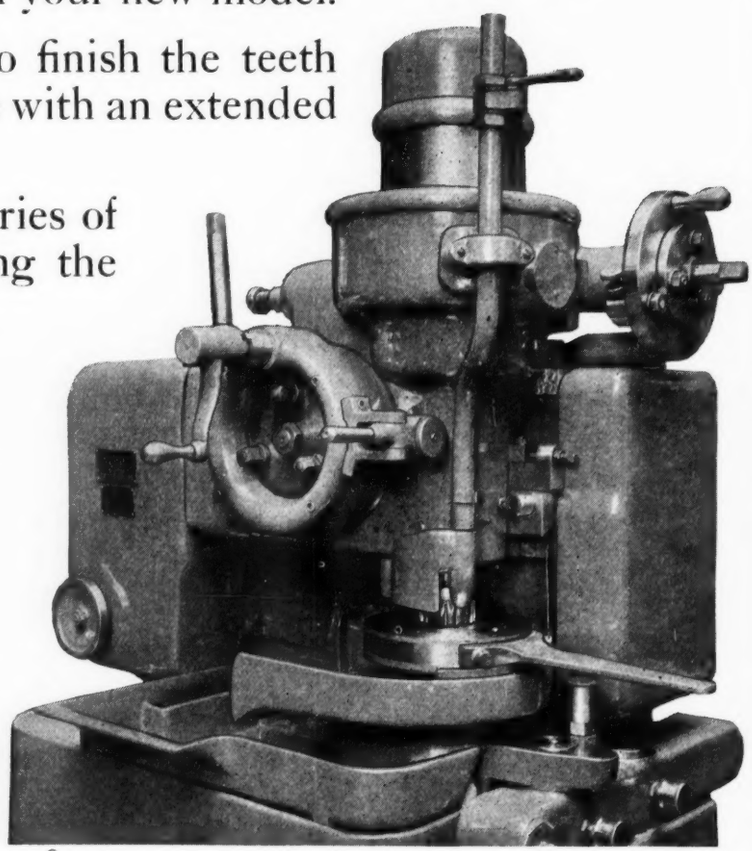
If you are not at present using the internal type of gear for the clutch in your transmission—do so in your new model.

Here is a new way to finish the teeth when the gear is made with an extended hub:

First, rough drill a series of holes before machining the forward end of the blank. Then finish the resulting half holes to the correct shape by a side-swiping Gear Shaper cutter.

You will cut your costs and get a better product. Full information upon request.

Close view of High-speed Gear Shaper equipped with Side-swiping attachment for finishing direct-drive clutch gears.



THE FELLOWS GEAR SHAPER COMPANY

Head Office and Works: 78 River Street, Springfield, Vt., U. S. A.

Branch Office: 651 Book Building, Detroit, Michigan

IT is generally conceded that the ball bearing has less friction than any other type of bearing—hence less wear.

While other types may cost less initially (because invariably made of lower carbon content steel and to less precise dimensions) the time is bound to come when such bearings will need readjustment and eventual replacement, all claims to the contrary notwithstanding.

Considering the excessive cost in loss of production, increase of overhead and labor expense to make these adjustments or replacements, is it not wisdom to use the New Departure Ball Bearing, since its first cost is the last cost—a true economy in many ways.

THE NEW DEPARTURE MANUFACTURING COMPANY

Detroit BRISTOL, CONNECTICUT Chicago

Resident representatives in industrial centers. Service stocks in 800 cities

New Departure Quality Ball Bearings

672

GRAMIX

Graphite-metal mixture Self-lubricated Bearings

You shall not confuse GRAMIX with any other bearing. It is different—and experience proves it is better.

Tough and ductile, GRAMIX withstands both radial and thrust loads.

Ideal for all neglected bearings, such as pilot bearings, pump shaft bearings, generator bearings, starting motor bearings.

The result of years of research, countless laboratory and service tests, GRAMIX is a combination of natural graphite (Nature's finest solid lubricant) and metals scientifically compounded.

Ask for samples to try out in that hard-to-get-at bearing.

THE UNITED STATES GRAPHITE COMPANY

SAGINAW, MICHIGAN

USG

"The Spirit of St. Louis" just prior to its record-breaking flight from New York to Paris.

Again, Agathon Alloy Steels Stand the Grueling Grind of a History-Making Flight

EVERYONE knows, by this time, that Captain Lindbergh made careful preparations for his New York to Paris flight and that his success was not due to "luck." That Agathon Alloy Steels were used in the Wright Whirlwind Motor is only natural. These super-steels were selected for the crankshaft and cams, those important moving parts whose ability to stand up are a deciding factor in the success of an endurance flight. The crankshaft made over three million revolutions without falter or strain. Also the chrome molybdenum tubing used in the landing gear and engine was made from Agathon Alloy Steel by the Ohio Seamless Tube Company of Shelby, Ohio. This is the third time within a short period that Agathon Alloy Steels have stood the grueling grinds of history-making flights. They were used in the engines which propelled Captain Byrd over the North Pole and recently in the engines which kept the Bellanca plane aloft for over 51 hours to break the world's endurance record.

For ordinary wear or extraordinary service, Agathon Alloy Steels give the utmost satisfaction.

AGATHON STEELS

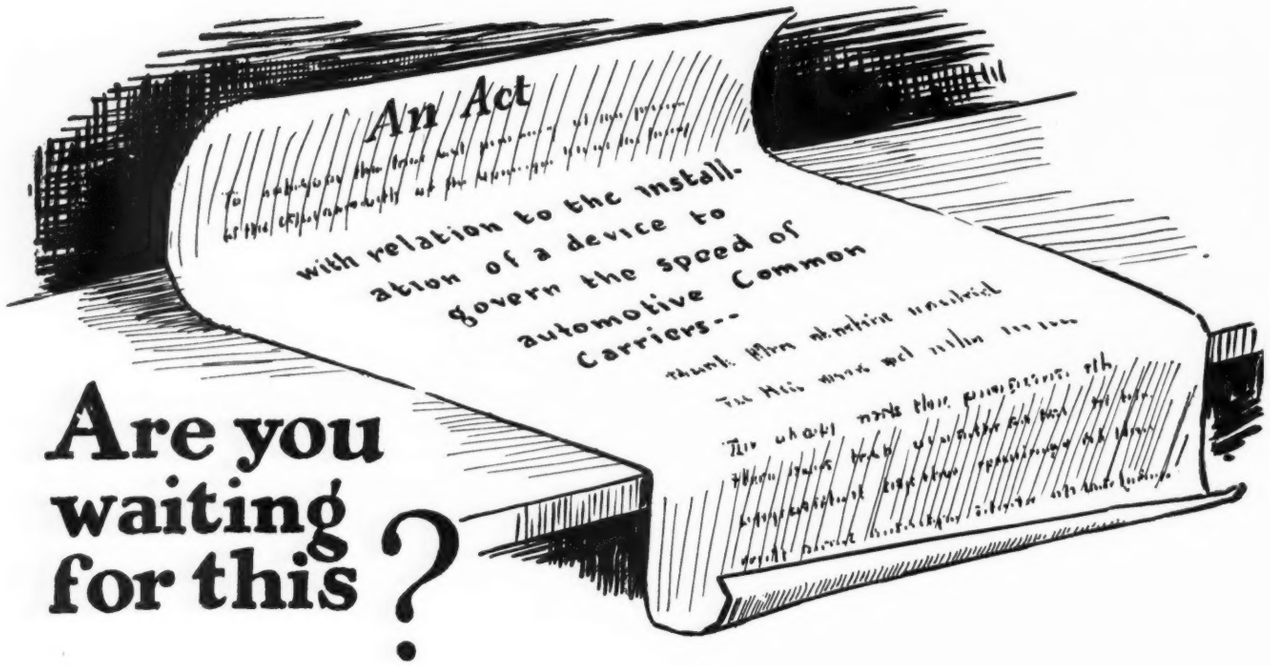
Central Alloy Steel Corporation, Massillon, Ohio

World's Largest and Most Highly Specialized Alloy Steel Producers

Makers of Toncan Copper Mo-lyb-den-um Iron

Cleveland · Syracuse · San Francisco · Detroit · Philadelphia · Chicago · Los Angeles · New York · Tulsa · St. Louis · Seattle · Cincinnati

AGATHON ALLOY STEELS



Are you waiting for this ?

State regulation of the speed of buses is not new. Already five states have such laws on their statute books and the importance of such regulation is under serious consideration in other legislatures.

This may or may not be the proper way to solve this problem—you are entitled to your own opinion on that. But here is the *one big point* YOU can't escape.

If speed control is of sufficient importance to be enacted into law in many states, it certainly warrants *your* serious consideration and a thorough knowledge of such equipment before it is placed on the statute books of your state.

Being the world's largest governor builders, we are naturally in position to give you accurate, first-hand information on all phases of this subject. We can show you how other bus operators have cut costs and prolonged the life of their equipment. Just ask us!

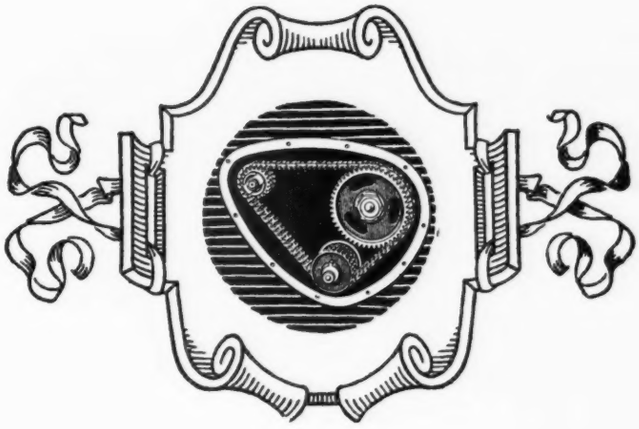
PIERCE Governors

The subject of governors is becoming more and more vital. It concerns profits more intimately than most operators realize. Our Booklet No. 37 contains a lot of interesting facts and data.
May we mail a copy to you?

THE PIERCE GOVERNOR COMPANY

World's Largest Governor Builders

Anderson, Indiana



THE unsurpassed excellence of Link-Belt Timing Chains is proven by their continued use as standard equipment on so many of the carefully built motor cars of America—and Europe.

And the impressive list of Link-Belt users is constantly increasing—because Link-Belt's years of painstaking manufacture have resulted in a degree of perfection that has earned world-wide recognition by experienced engineers and manufacturers.

LINK-BELT

AUTOMOTIVE SILENT TIMING CHAIN

3023

LINK-BELT
COMPANY
INDIANAPOLIS
DETROIT

SILENT

"The Right Bearing for Every Car"

BCA

For the Clutch Throw-out Position This B. C. A. Bearing

B. C. A. Thrust Bearings give super service in the clutch throw-out assembly. By their scientific design they take the thrust load with an ample factor of safety.

Automotive engineers have learned that B. C. A. Thrust Bearings *do* make a difference in the operation of the car. Their smooth action gives noiseless operation when the clutch is thrown out. Their precise accuracy guarantees a long life of trouble-free service.

B. C. A. Thrust Bearings have a record of use year after year in most of America's finely built motor cars.

It will pay you to investigate B. C. A. Ball Bearings. Let us give you the facts.

Detroit, Michigan, Office
1012 Ford Bldg.

THE BEARINGS COMPANY of AMERICA
LANCASTER, PA.

SPRING MAKERS FOR THREE GENERATIONS

SPRINGS, WIRE & STEEL EST. BARNES-MADE PRODUCTS 1857 SCREW MACHINE PRODUCTS

5 REASONS *for Specifying* Barnes-made Quality Springs

1. Carefully chosen, manufactured and tested materials.
2. Carefully checked tooling and forming.
3. Careful hardening and tempering, in heat-regulated furnaces.
4. Careful and detailed inspection.
5. Carefully met deliveries.

Perhaps two or three of these reasons may be found in many organizations, but we believe all are nowhere better combined than in the manufacture of Barnes-made Springs.

The WALLACE BARNES COMPANY, Bristol, Connecticut.

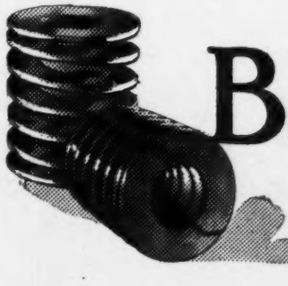
Attached is blueprint or sample spring used in .....(NAME OF PRODUCT) Please quote us on .....(QUANTITY), made in accordance with the Five Reasons listed above. No obligation on our part.

Name _____

Firm _____

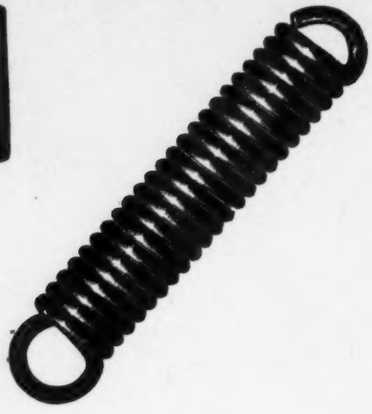
Address _____

_____



Barnes-made Springs

SPRINGS
STAMPINGS
ASSEMBLIES
SPRING WASHERS
SCREW MACHINE PARTS
COLD ROLLED SPRING STEEL



The Qualities *for* Untiring Service

built into

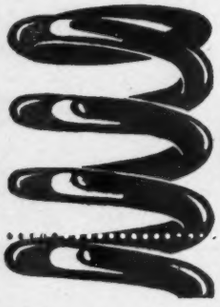
Raymond Springs

resulting from carefully selected, tested materials and experienced, painstaking workmen are worth more to your mechanism than any other consideration in making a purchase of Springs.

Send samples or blueprints for estimates

Raymond Mfg. Co.
Corry, Pennsylvania

If it's a Spring



GIBSON CAN MAKE IT!

THE range and variety of our output is truly tremendous. Spiral Springs, Flat Springs, Heavy-Duty Springs, Springs for immense valves, Springs for minute scales, Springs for refrigerators, Springs for automobiles, Springs for anything, almost, you can name.

Materials of all kinds from alloy steels to brass, sizes from the diameter of a hair to a 2-inch square—quantities small or large—tests as required—it's all within our scope.

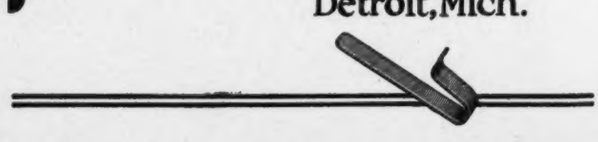
Just send your inquiries

WM. D. GIBSON COMPANY
Clybourn Ave. and Willow St.
CHICAGO, ILL.

The convenient and prompt source of supply for any spring needed by the Automotive Industry (leaf and cushion springs excepted)

B.G.R. INC.

BARNES GIBSON RAYMOND INC.
6400 Miller Avenue
Detroit, Mich.



Small Tools —

Their Performance is a vital factor in many machine tool operations

Cutting Indirect Costs

Machine hour costs are cut by using small tools that save idle machine hours. Cost cutting small tools stand up on the job, reduce time out for repairs, adjustments and changes.

Important, also, is the effect of small tool performance upon labor costs. Small tools that break or require too frequent resharpening cut down the operator's morale.

Even power consumption is a real item though not always considered in relation to the selection of small tools. Some tools on a given job may consume twice as much power as others.

Check Up Your Small Tool Performance

An easy way to check the efficiency of small tool operations in your shop is to send for a GTD engineer. He is far more than a salesman. Daily, he comes into close contact with tool users and small tool problems in every industry. He is backed by a research department in Greenfield.

An Expert at Your Call

Because this GTD engineer is a trained man, expert in his line, he will understand your small tool problems. You can trust him. If you give him a chance to help it is likely that he will be able to point a way to lower costs and more profitable operation.

No Obligation

A survey of small tool performance in your plant entails no obligation on your part. GTD men recommend their own tools only where they are confident that these tools benefit the buyer.

Come to Headquarters!

MACHINE TOOL DIVISION

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

New York—15 Warren St. Chicago—13 S. Clinton St.
Detroit—224-226 W. Congress St.
Canadian Plant: Greenfield Tap & Die Corporation of Canada, Ltd., Galt, Ontario

Greenfield Tap & Die Corp.
Greenfield, Mass.

I would like one of your tap engineers to call at our plant.

Signed.....

Firm .....

Auto. Ind., June 25

A Parade of the *Prominent*

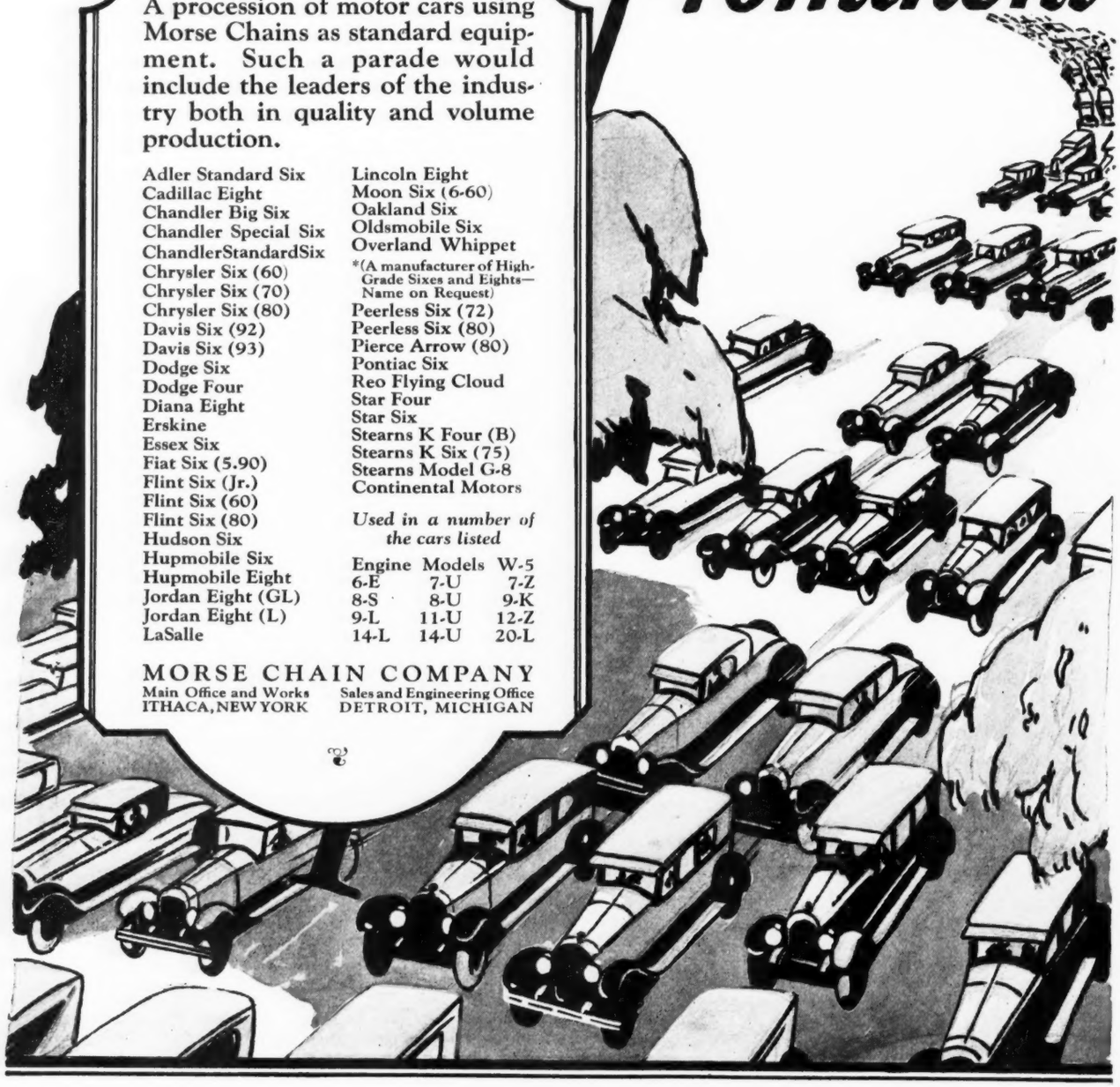
A procession of motor cars using Morse Chains as standard equipment. Such a parade would include the leaders of the industry both in quality and volume production.

Adler Standard Six
Cadillac Eight
Chandler Big Six
Chandler Special Six
ChandlerStandardSix
Chrysler Six (60)
Chrysler Six (70)
Chrysler Six (80)
Davis Six (92)
Davis Six (93)
Dodge Six
Dodge Four
Diana Eight
Erskine
Essex Six
Fiat Six (5.90)
Flint Six (Jr.)
Flint Six (60)
Flint Six (80)
Hudson Six
Hupmobile Six
Hupmobile Eight
Jordan Eight (GL)
Jordan Eight (L)
LaSalle
Lincoln Eight
Moon Six (6-60)
Oakland Six
Oldsmobile Six
Overland Whippet
*(A manufacturer of High-Grade Sixes and Eights—Name on Request)
Peerless Six (72)
Peerless Six (80)
Pierce Arrow (80)
Pontiac Six
Reo Flying Cloud
Star Four
Star Six
Stearns K Four (B)
Stearns K Six (75)
Stearns Model G-8
Continental Motors

Used in a number of the cars listed

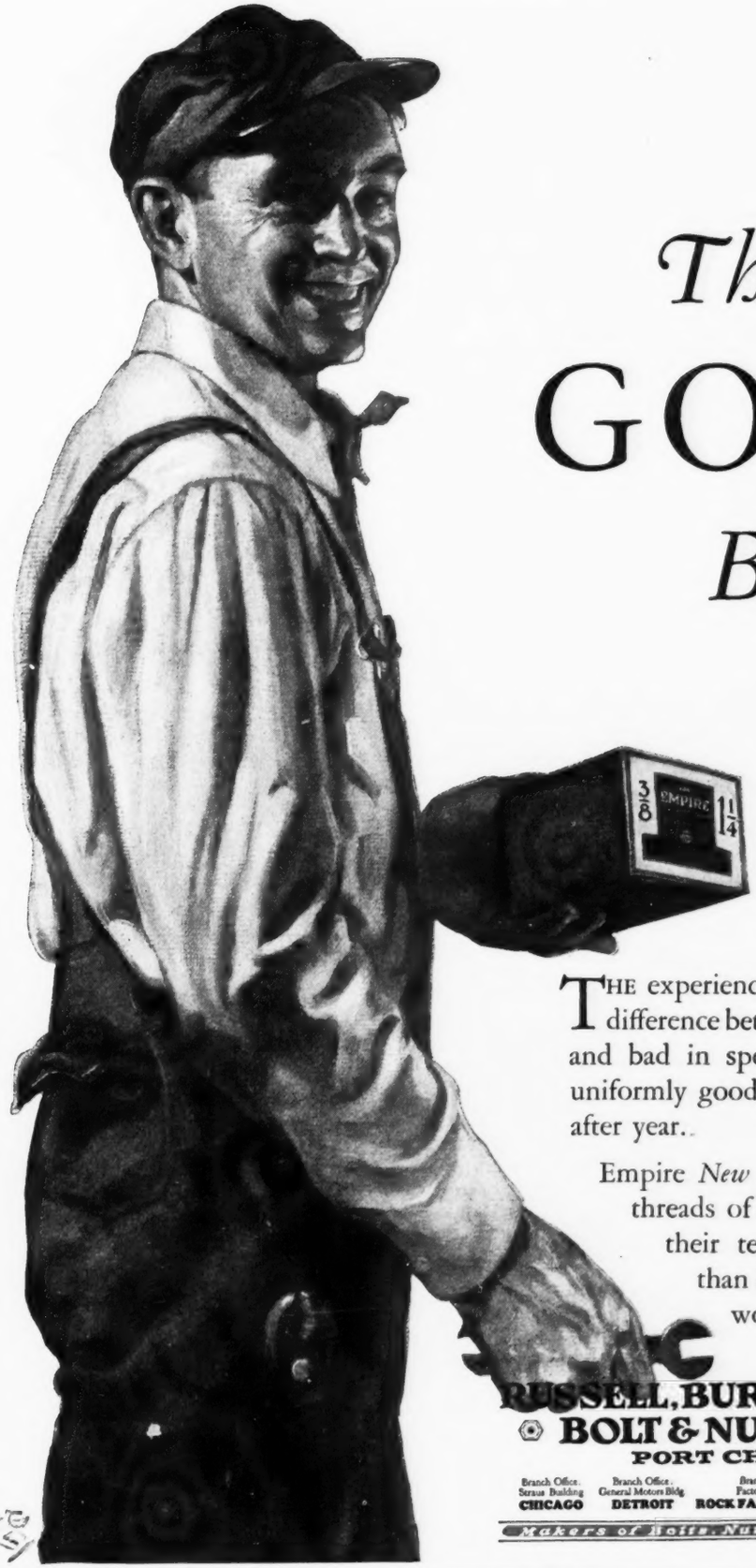
Engine	Models	W-5
6-E	7-U	7-Z
8-S	8-U	9-K
9-L	11-U	12-Z
14-L	14-U	20-L

MORSE CHAIN COMPANY
Main Office and Works
ITHACA, NEW YORK
Sales and Engineering Office
DETROIT, MICHIGAN



MORSE

GENUINE SILENT CHAINS



They're GOOD *Bolts*!

THE experienced mechanic knows the difference between bolts that are good and bad in spots, and bolts that run uniformly good day after day and year after year.

Empire *New Process* Bolts, with their threads of gauge-like accuracy and their tensile strength of more than 80,000 lbs., speed up the work and *insure* its strength.

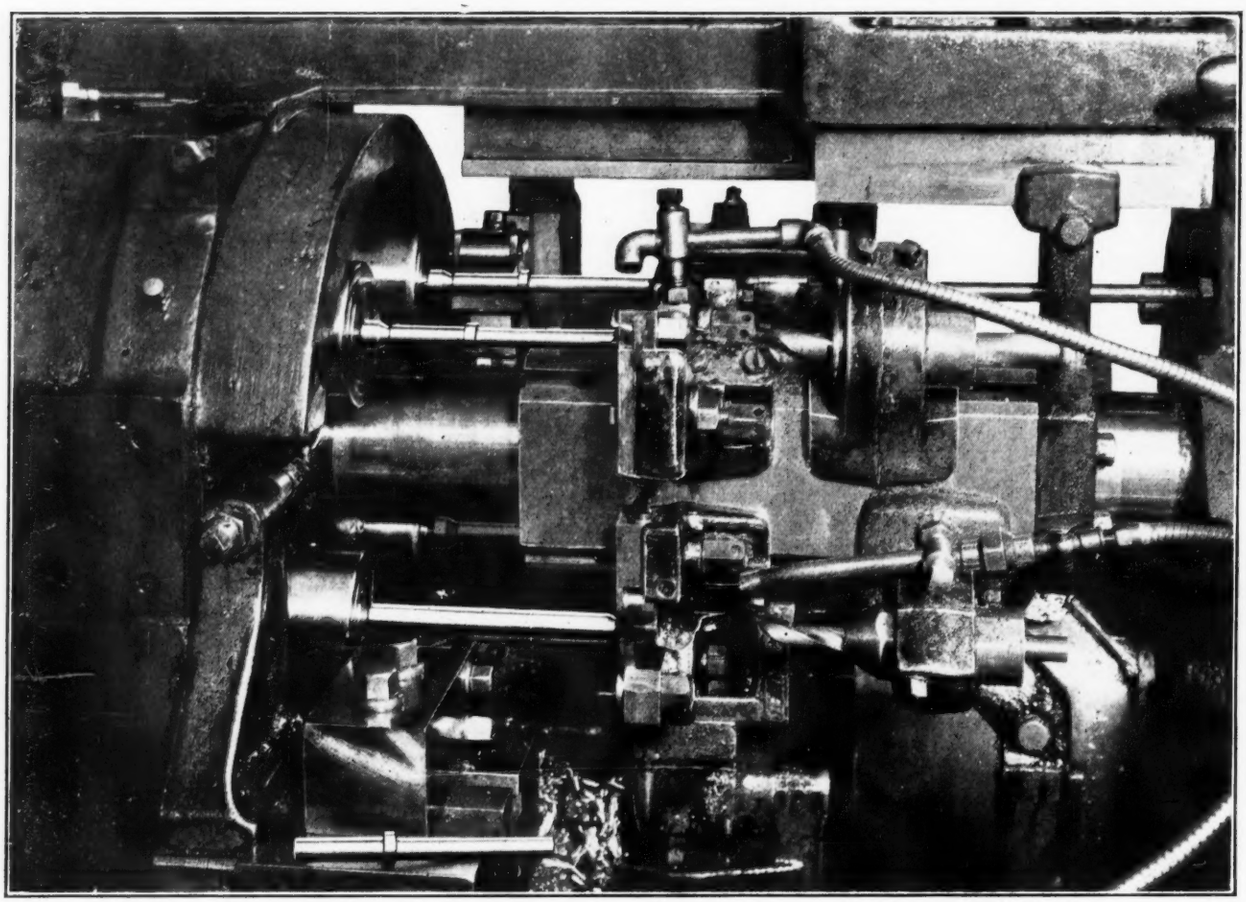
RUSSELL, BURDSALL & WARD
BOLT & NUT COMPANY
PORT CHESTER, N.Y.

Branch Office. Straus Building	Branch Office. General Motors Bldg	Branch Factory:	Stringle & Gillette 269 Jackson Street	Maydwell & Hartzell, Inc. 158-168 Eleventh Street
CHICAGO	**DETROIT**	**ROCK FALLS, Ills.**	**SEATTLE**	**SAN FRANCISCO**

Makers of Bolts, Nuts and Rivets Since 1842

EMPIRE *New Process* BOLTS

Gridley Multiples



Make Short Work of Long Jobs

To efficiently handle the "long shaft jobs," so frequently encountered in automotive plants, a multiple spindle automatic must possess certain characteristics. It must have smoothly powered, accurately spaced spindles. It must have a turret which is permanently aligned with the spindles and upon which tools can be "close held"—one set behind another. It must have sturdy, accurately working forming slides.

The new Gridley Multiples, Model G, have these vital characteristics. Their balanced spindles, driven by helical gears, are mounted in a unique spindle carrier which is ground to size and to exact spacing like a precision jig. The famous Gridley Turret, mounted upon an extension of the spindle carrier, allows long work to pass through a series of "close held" tool holders in all four positions. Rugged forming slides, smoothly operated by direct cam action, allow wide forming cuts on any spindle.

Gridley Multiples, Model G, allow splitting up of long operations. They save time and assure accuracy coupled with unfailing production on your long shaft jobs. They will handle your short work just as efficiently and accurately.

Send samples or blueprints for Gridley estimates

The National Acme Company

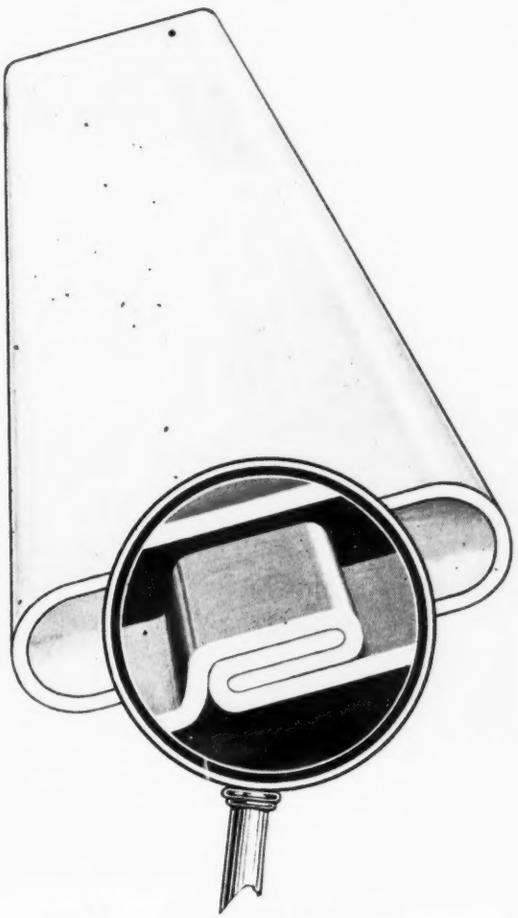
Cleveland, Ohio — Windsor, Vt.

New York — Detroit — Chicago

Makers of Acme and Gridley Multiple Spindle Automatics, Gridley Single Spindle Automatics and Gridley Multiple Spindle Chucking Machines at Windsor, Vermont, and NAMCO Self-Opening Dies, Collapsing Taps and Screw Machine Products at Cleveland, Ohio

LOCK-SEAM TUBING

is Best for Radiator Construction



—STRONG, MECHANICAL JOINT
—BURSTING PRESSURE 1,100 POUNDS AND UP
—STRAIGHT WATER CIRCULATION
—NO POCKETS
—DIFFICULT TO DAMAGE
—EASY TO REPAIR
—DOES NOT BURST WITH FREEZING
—RESISTS ALKALI WATER

Your Competitor Who Makes His Own Knows—

A survey of car manufacturers who make their own radiators reveals that the majority use only LOCK-SEAM TUBING. There are reasons for this. Your engineers and purchasing department will be interested. *Wire or write today. Our representative will call.*

Car Manufacturers Should Specify Lock-Seam Tubing

In Radiator Construction–

Brass and Copper Products

Sheets and Strips, Tinned Copper, Brass, Bronze in coils. Lead coated copper brass (free from tin). Stampings, Eyelets, Terminals, Lock-Seam Tubing, Copper, Brass, Steel or Zinc.

All Shapes and Sizes In Every Gauge of Brass and Copper

Plain, tinned outside, or tinned both sides —all handled with equal accuracy. LOCK-SEAM TUBING retains the life and elasticity of the metal as they were in the ingot —the crystalline structure is perfect throughout.

Resists High Internal Pressure and has proved its superior merit

in economy and greater cooling capacity. LOCK-SEAM TUBING is produced by means of highly developed machinery—*utilizing continuous operation from the raw material to the finished tube. This effects a great saving* and insures a uniform product with service and cooperation, which built the Dallas reputation.

DALLAS BRASS & COPPER CO.

820 ORLEANS STREET CHICAGO, ILLINOIS

PITTSBURGH SEAMLESS

Pittsburgh Seamless In The Modern Automobile

PITTSBURGH SEAMLESS

AMERICAN automotive engineers for years have been successfully reducing the weight of automobiles without sacrifice of strength, and in this they have been greatly aided by Pittsburgh Seamless Steel Tubing. In fact, practically every American automobile makes use of "Pittsburgh Seamless" for one or more vital parts such as drag links, tie rods, propeller shafts, brake rocker arms, steering columns, axle tubes and bearing races.

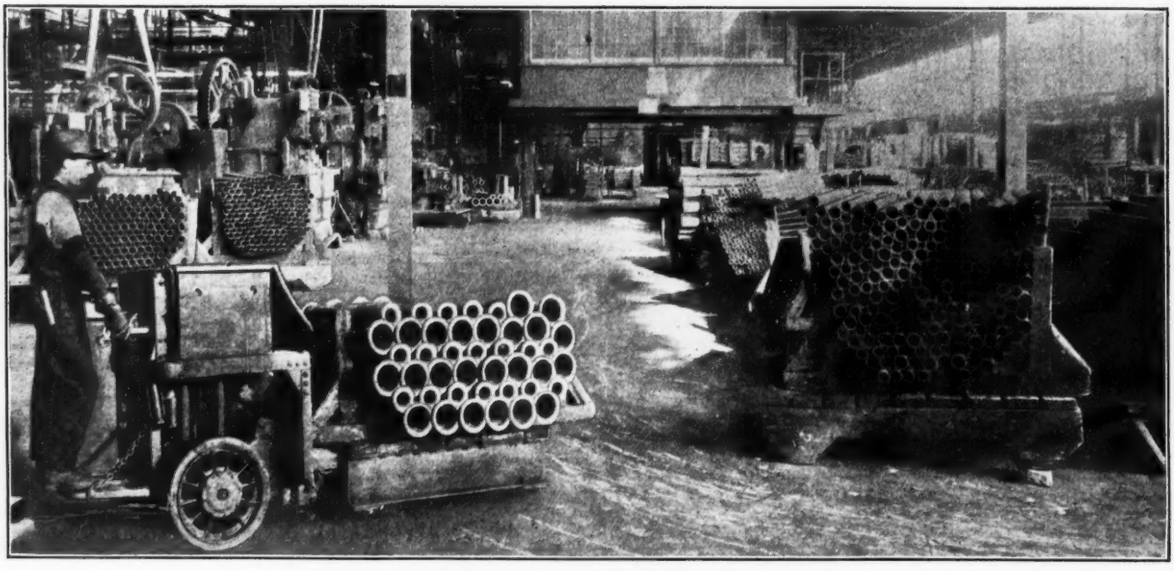
"Pittsburgh Seamless" in the automotive industry is noted for its exceptional high quality and uniform physical and chemical properties. Our manufacturing facilities are devoted exclusively to the production of seamless steel tubes pierced from solid billets of basic open hearth steel. Our sales and engineering staffs are at your service.

Pittsburgh Steel Products Co.

Union Trust Bldg.
PITTSBURGH, PA.

General Motors Bldg.
DETROIT, MICH.

NEW YORK CHICAGO HOUSTON TULSA



FORMED SEAMLESS TUBES FOR AUTOMOTIVE PURPOSES

HP

HERCULES POWER

The symbolic contraction "HP", by a great deal more than accident, stands for Hercules Power just as it does for Horse Power.

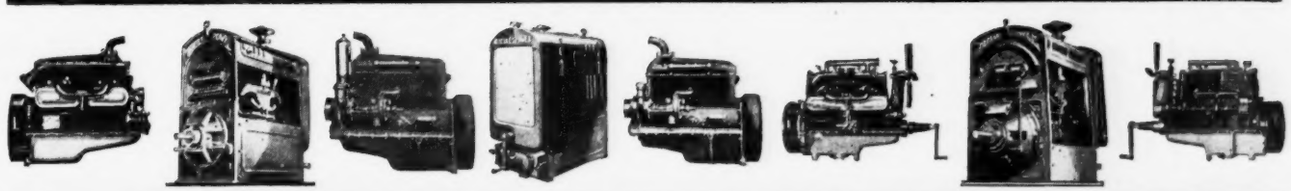
For it was in the development of Horse Power—in other words the largest cubic inch displacement with the smallest external dimensions and least weight—that each of the eight Hercules Engines was designed.

It is in furtherance of this principle of "most Horse Power per pound of engine" that Hercules manufacturing standards are held to their unprecedented rigidity.

"HP" means Hercules Power—Horse Power!

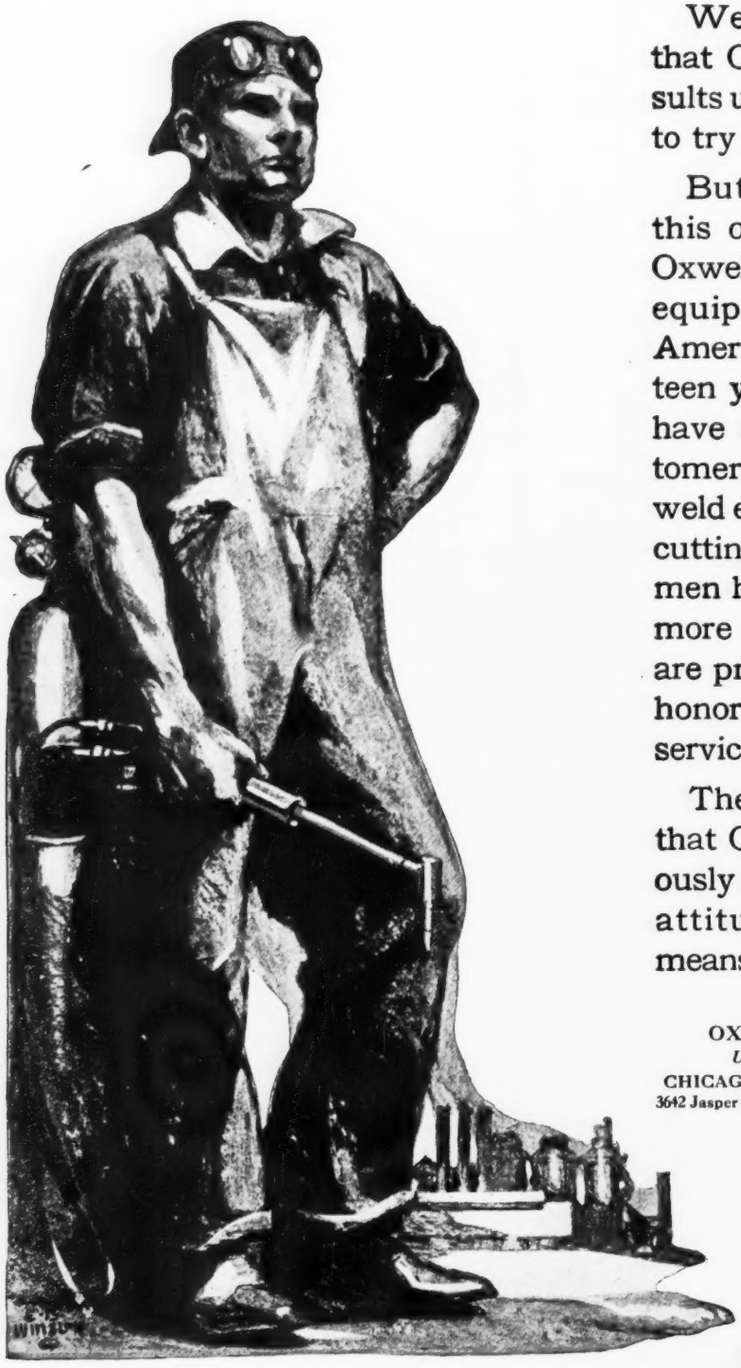
HERCULES MOTORS CORPORATION
CANTON, OHIO, U. S. A.

HERCULES



ENGINES

There are two kinds of "service"



ONE KIND of "service" means only promises and the other kind produces results.

We do not ask you to believe that Oxweld service means results until you have had occasion to try it.

But we do ask you to think this over! For fourteen years Oxweld injector blowpipes and equipment have been sold to American industries. For fourteen years Oxweld service men have aided and instructed customers in the efficient use of Oxweld equipment for welding and cutting. Some of these service men have been with Oxweld for more than ten years. And they are proud of the job, for it is an honor to be selected for Oxweld service work.

These are facts. They indicate that Oxweld takes service seriously and believes in it. It is an attitude toward service that means—results.

OXWELD ACETYLENE COMPANY
Unit of Union Carbide and Carbon Corporation

CHICAGO
3642 Jasper Pl.

UCC

SAN FRANCISCO
1050 Mission St.

LONG ISLAND CITY, N. Y.
Thompson Ave. and Orton St.

STOCKS IN 39 CITIES

Oxweld

WELDING AND CUTTING APPARATUS

Now!

TRADE

KINITE

MARK

you can have this remarkable metal in Bar Stock

Dies made of KINITE give three to six times the number of operations without re-dressing

The KINITE CORPORATION

(See reverse side)

KINITE BAR STOCK

"Let us have Kinite in bar stock that we may make our simpler, smaller dies in our own shops."

Frequently manufacturers who had learned of the tremendously greater Kinite resistance to abrasion, have asked for this better die-steel in bar form to carry in stock in their tool-rooms. Kinite dies cast to shape in the Kinite shops and furnished to manufacturers in machinable form, set such production records—made such longer runs without a "re-grind" that many shops also wanted Kinite in bars for making up their own smaller, simpler, more standard dies.

The demand for Kinite in bar stock grew at an unheard of rate—increased to a point where a separate division of the Kinite plant had to be set aside to handle this phase of Kinite production. A separate line of standard bar shapes had to be established.

Now! Volume sales—volume production have made it possible for you to secure Kinite in standard bar shapes. And at a price that was impossible for us to quote during the earlier stages of the demand.

Now! You can bring Kinite savings into play on the smallest dies you use—and at a reasonable figure.

The many users of Kinite will recognize at once the value of this additional service. If by any chance, you are unfamiliar with Kinite, it will pay to investigate at once. In either case the coupon below is for your convenience in getting complete information.

TRADE KINITE MARK

Wears three to six times as long

Attains maximum hardness by cooling from 1850°F in still air

Saves time, increases production by greatly reducing stops for re-dressing dies

Look for the "Diamond" Trade Mark it is your guarantee of KINITE performance

The KINITE Corporation
1340 St. Paul Ave., Milwaukee, Wis.

Please send me your folder describing the properties of KINITE and full information on sizes, etc.

Name.....

Address.....

.....

Company.....

The KINITE CORPORATION
1340 St. Paul Avenue
Milwaukee, Wisconsin, U.S.A.

ORPHANS

There are two kinds of orphans in the automobile industry, just as there are in life. The one is that where the company—the makers—have gone out of business.

The others are those discontinued models—which present makers like to disown and forget.

It is these latter "half-orphans" particularly that make for hard feeling on the part of car owner and repairman when they are delayed in getting service parts.

The easy solution—and the one being followed by many far-visioned managers—is the selection of approved Standard Replacement or Service Parts, as made by well established, reputable manufacturers—with authorization that the service stations and the local distributors pick up these parts from the jobber or distributor. Thus an expensive and difficult situation is easily provided for. Or your own service department can purchase and distribute these approved parts.

B-N Piston Pins—recognized as perfect in quality, accurate in measurement, and perfectly lapped in finish—are today stocked and distributed by over 350 Jobbers and Distributors. This network covers the country.

If you would like to solve your "orphan" problem as far as piston pins are concerned, we shall be glad to give you complete data. An inquiry incurs no obligation.

C. W. Burgess
President.

Burgess-Norton Mfg. Co.

Established 1903

512 Peyton St. Geneva, Ill.

Branches

174 Spring St.	253 36th St.	West Fort and 10th Sts.
Atlanta, Ga.	Brooklyn, N. Y.	Detroit, Mich.
(Own Warehouse)	(Bush Terminal)	(Coe Terminal)

Construction Features *of the* Brown & Sharpe No. 3A Universal Milling Machine *that are* Profitable Production Features

ACCURATE CONSTRUCTION
adapts it for work of the highest precision.

CONVENIENT CONTROL
saves the operator many extra steps back and forth and speeds up his work.

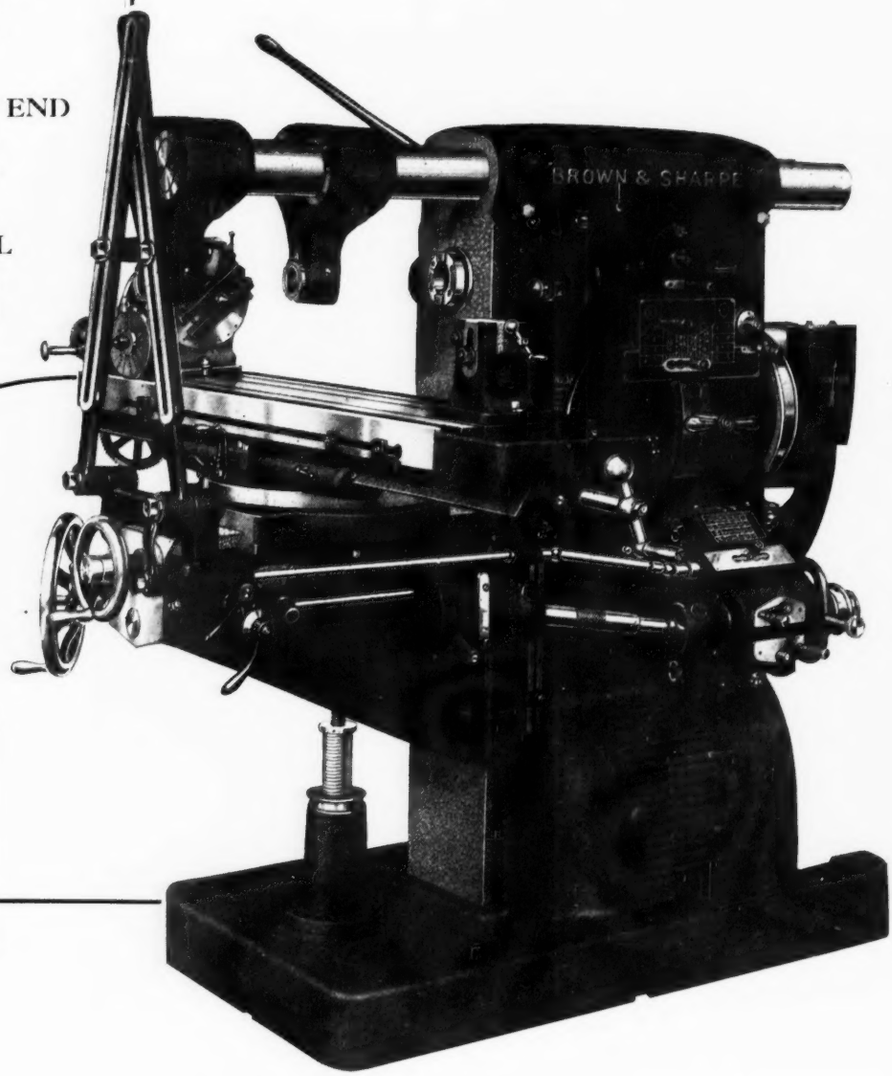
SPIRAL HEAD
gives large number of divisions.

MOTOR-IN-THE-BASE TYPE
completely protects the motor from oil and dirt when motor driven.

RIGID SUPPORT *for* ARBOR
—two yokes and the double overarm permit heavy cuts without arm braces.

STANDARDIZED SPINDLE END
in addition to economy of equipment permits placing chuck close to column.

POWER FAST TRAVEL
is of advantage when running the work up to or away from cutters.



BROWN & SHARPE MILLING MACHINES
have the
Standardized Spindle End
adopted by the
MILLING MACHINE MANUFACTURERS
of the
NATIONAL MACHINE TOOL BUILDERS ASSOCIATION

BROWN & SHARPE

BROWN & SHARPE MFG. CO. PROVIDENCE, R. I., U. S. A.

VALVE SEAT REAMER SETS

Service Station Sets

Set No. 62 Specially designed for Mack Trucks
Special sets furnished for all makes of cars

SIOUX
Trade Mark Reg. U.S. Patent Office

LEADING Car Manufacturers are recommending Sioux Reamers to their distributors and dealers. They found, after careful investigation, that with Sioux Valve Seat Reamers their service stations can give the kind of valve service they want their car owners to have.

We have, or will furnish, a special Sioux Valve Seat Reamer Service Station set for *your* car, including all reamers required for refacing and narrowing valve seats. We also include oversize pilot stems for use in worn guide holes to assure the snug fit necessary for reaming the seat in proper alignment with the guide hole. Write us about your requirements.

ALBERTSON & CO. Sioux City, Ia., U. S. A.

Over Three Million Passenger Car Bodies

built annually by readers of AUTOMOTIVE INDUSTRIES

To do this they require:

About 375,000 tons of sheet metal, close to 7 million pounds of curled hair and cushion stuffing material, approximately 50 million square feet of plate glass, over 15 million yards of upholstery fabrics, about 2½ million yards of carpet, over 3 million pounds of dry glue, about 3 billion screws and 85 million bolts, over a billion feet of lumber, upward of 5 million yards of artificial leather for closed car decks, close to 5 million gallons of liquid paint and varnish, about ten million pounds of white lead and dry paint and some two billion hardware units.

These are imposing figures which vendors of all body parts and materials will do well to consider. This market is reached most effectively by

Automotive Industries

Don't blame the Chinese

Hundreds of Chinese coolies toiling in the hot sun, carrying dirt from an excavation—while one American steam shovel and a Mack truck would do more in a day than they do in a week.

The Chinese may be years behind the times when it comes to labor-saving machinery. The American manufacturer, reading in the National Geographic of the crude coolie methods smiles with superior wisdom.

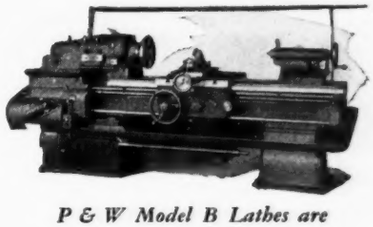
He has lathes that are only fifteen years old. They perform miracles that even thousands of Chinese coolies couldn't do.

But he doesn't realize that, compared with a Pratt & Whitney Model B Lathe, his fifteen-year-olders miss being modern by a great gap. (And if you miss the Twentieth Century by a minute, it is gone and you are no better off than the man who missed it by a hundred minutes.)

Fifty years ago men never dreamed of a lathe such as this. Fifteen years ago, any lathe man would have doubted the coming of such a lathe.

But it is here—a lathe with a geared head that purrs its way through as the tool cuts into the metal. What a smooth, beautiful action it has. How responsive it is to the split-second control of the operator! And with it all what a work-eater and money-saver.

We urge you to come to Hartford and see how this lathe is made. If that is not possible, let us tell you where there is an installation near you that you can see. For your own sake do not buy another lathe until you have found out about the Model B Lathe—the mechanical excellence of it and the splendid quality of work it does in such low-cost-making quantities. Write. Tell us when you will come or ask us to send a man to you.



P & W Model B Lathes are made in 3 sizes—13", 16", and 20". Which size fits in with your needs? Ask us for details.

Through these windows in the headstock you can see the Ground Maag Gears that run in a continuous bath of oil.

PRATT & WHITNEY CO., *Hartford, Connecticut*
Division NILES-BEMENT-POND COMPANY

PRATT & WHITNEY

BIRMINGHAM PHILADELPHIA ST. LOUIS LOS ANGELES SAN FRANCISCO CLEVELAND BOSTON
ROCHESTER CHICAGO PITTSBURGH DETROIT CINCINNATI NEW YORK

There's a Better Way than Cutting Prices

Where Sales Are Made~

in clubs, offices, homes and wherever else owners meet and compare experiences—the reputation of the Raulang-equipped closed car is safe.

"THERE, that's what I've been waiting for—prices of Luxuria closed models reduced. Think I'll go over right now."

"A Luxuria! I wouldn't have one at any price. West had his on our trip last summer and it rode all right but the body was awful. Doors stuck, windows rattled, and we had to stop twice to have body squeaks fixed up. After that, anything but a Luxuria for me. I've got a Tourabout closed job, and those people know how to build automobiles. Powerful, economical, and a sound, solid body that never needs repair. The value's there—they don't have to cut prices."

Three guesses—which car is the first speaker going to buy now, price cut to the contrary notwithstanding?

THE BAKER-RAULANG COMPANY
Raulang Body Division · *Cleveland, Ohio*

Savings *by* Smith

Due to the wide experience and the extensive engineering staff of the A. O. Smith Corporation, it is frequently possible for this company to submit suggestions for improvement of frames. Our specialists in Frame Engineering work with the Frame Engineers and Executives of automobile companies, to secure great economy, utility, and freedom from trouble.

Economy and Improvement

Direct savings in cost combined with improvements in strength and utility have been effected by the Smith Engineering Service in 4 major ways.

1. The proper distribution of metal.
2. Fewer parts and rivets.
3. Lower manufacturing expense.
4. Easier assembly into the car.

Freedom from Trouble

Frequently the suggestions of the Smith Engineering Service have freed the customer from some operating difficulty that could be traced to frame design.

Engineering Service

This service is in charge of engineers who are specialists in the design and manufacture of automotive frames. It is available at any time—on new models long in advance of the time they will be in production. In this way the benefit of this service may be received at the time it is most valuable.

Manufacturing Facilities

The manufacturing facilities of the A. O. Smith Corporation are literally unrivalled in America or abroad. The South Plant, where frame assembly is largely automatic, is devoted to the fabrication of frames in quantities of 10,000 or over. Manufacture in the North Plant is semi-automatic and is confined to the production of frames ordered in smaller quantities.

The customer is thus assured that the frames he orders will be built by a method that will secure the utmost of economy for his volume.

Replacing Rights and Lefts with one interchangeable part Saved $.228 per Frame

Right hand and left hand hangers were used on one frame as it came to Smith.

By straightening the side rails slightly so that the faces of the flanges on the hangers became parallel it was possible to design a casting that was interchangeable.

The weight of the casting was reduced and by doubling the quantity per pattern the cost was reduced from $.54 to $.426 a saving of 21% on each casting or $.228 per frame—plus the advantages of interchangeability.

A. O. SMITH CORPORATION, *Milwaukee, Wisconsin*
Auto Products Division

SMITHSTEEL
FRAMES

THE WORLD'S BIGGEST MARKET FOR MACHINE TOOLS

THE intensity of the marketing operation should bear some definite relation to the relative size of the market which is being considered. It is not economical to put the same amount of effort into the cultivation of a small market as can be absorbed in the development of a more important consumer of a product.

For many lines of manufacturing equipment, including machine tools, many types of handling machinery, woodworking and other equipment, the automotive industry represents the largest and the most effectively consolidated market. It is worthy of definite and extensive cultivation by the manufacturer of such products because of its size and its definite grouping.

Its requirements are particular and in some cases peculiar and attention must be given to the problems involved in its manufacturing processes in order to properly intensify the market possibilities.

It is the largest manufacturing industry in the United States and the one which produces the most complicated product.

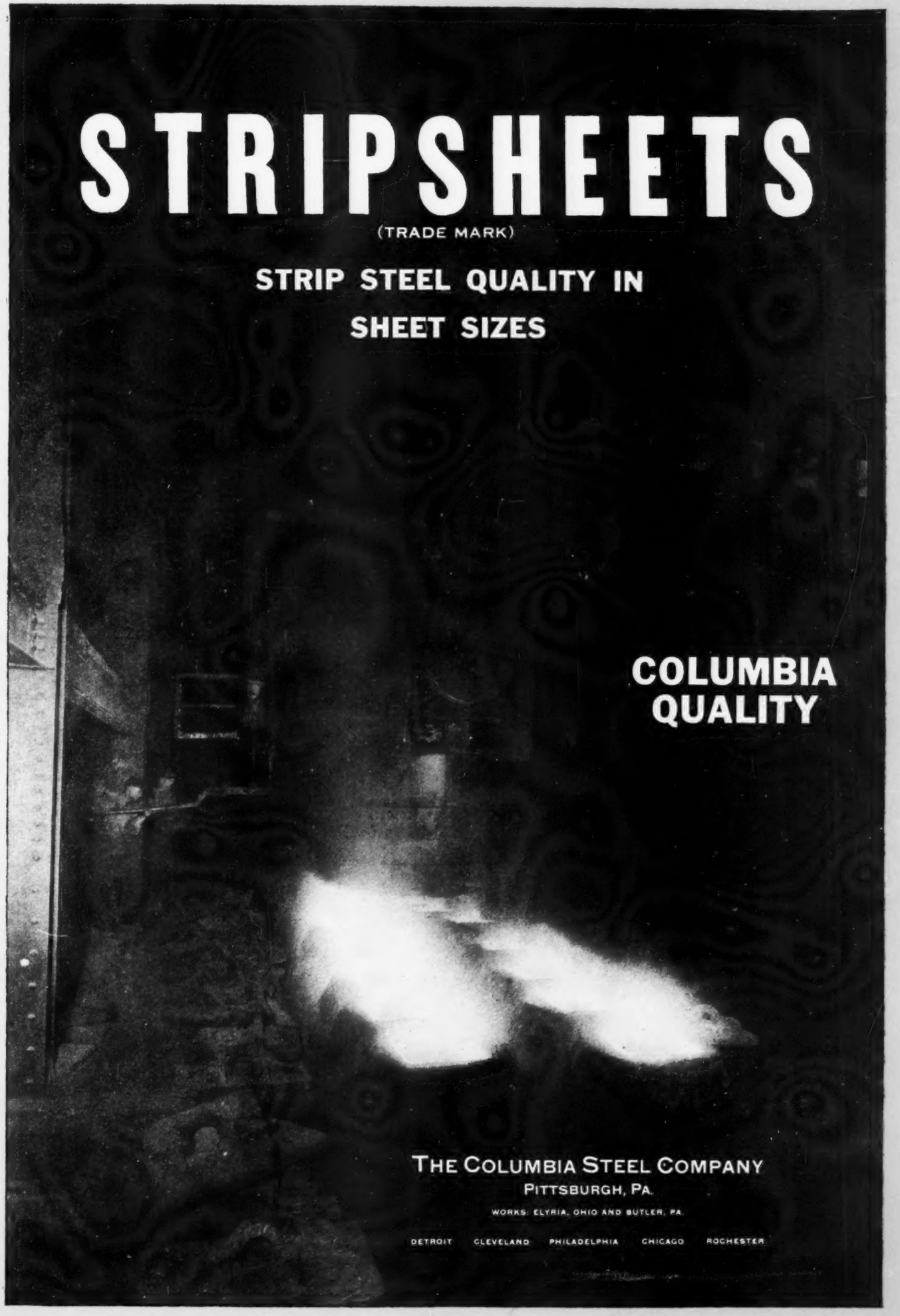
Consistent study of this market and persistent application in the consideration of its requirements would suggest the extensive and permanent possibilities offered within its area.

Automotive Industries.

STRIPSHEETS

(TRADE MARK)

STRIP STEEL QUALITY IN SHEET SIZES



COLUMBIA QUALITY

THE COLUMBIA STEEL COMPANY

PITTSBURGH, PA.

WORKS: ELYRIA, OHIO AND BUTLER, PA.

DETROIT CLEVELAND PHILADELPHIA CHICAGO ROCHESTER

STRIPSHEETS

(TRADE MARK)

"The first new steel commodity in forty-one years"

THE COLUMBIA STEEL COMPANY
PITTSBURGH, PA.

WORKS: ELYRIA, OHIO AND BUTLER, PA.

Detroit Cleveland Philadelphia Chicago Indianapolis

It is as hard to change some "easy-to-change" wheels as it is to collect an "easy" payment . . *but* when Budd says easy it *means* easy!

. . .

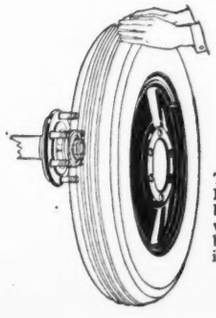
EVEN the brawny service station boys who juggle cylinder blocks like bean bags find it a strength-trying, finger-smashing job to change some steel wheels or demount some "demountable" rims.

But Budd-Michelin All-Steel Wheels can be changed *easily* by anyone who has skill enough to use a socket wrench. No loose bolts to monkey with, no series of holes to line up at the same time, no lugs to juggle. No rims to put on crooked. Simply put the pilot bar over one of the studs—lift the wheel with the bar—and the wheel slips easily into place. Then put on the cap nuts and you're done!

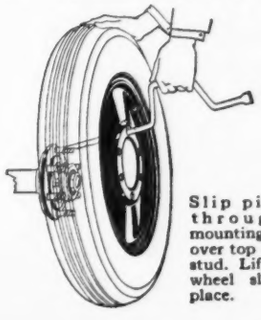
Compare this with other wheel mountings and you'll realize that it is one good reason why the wise motorist prefers Budd-Michelins.

BUDD
WHEEL COMPANY
Detroit

Budd Service Stations in all principal cities—parts and service for wheels of every type.

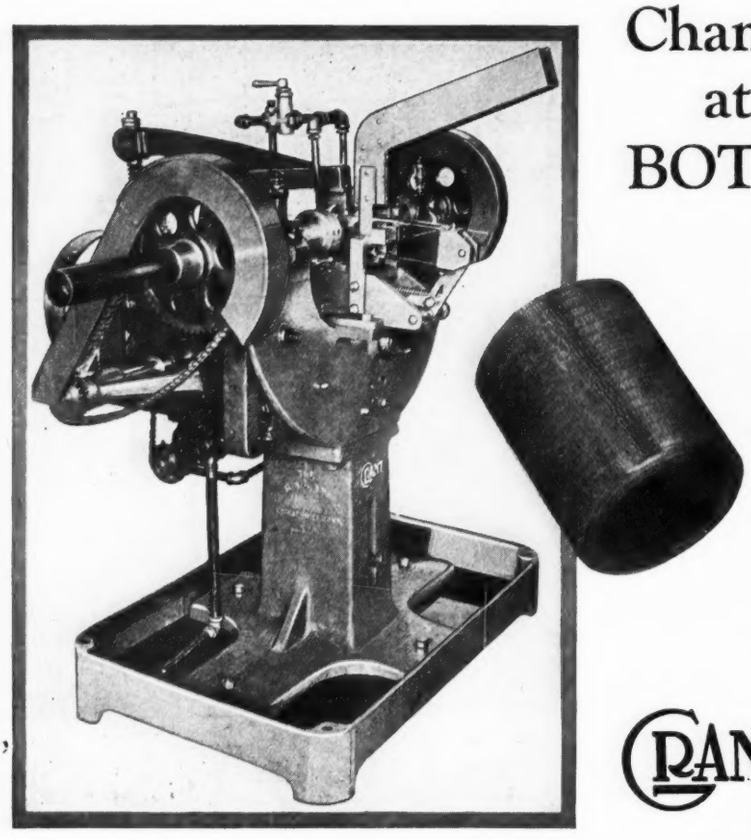


To put on a Budd-Michelin Wheel, set brakes and place wheel in position before the mounting studs.



Slip pilot bar through top mounting hole and over top mounting stud. Lift up and wheel slides into place.

Put on cap nuts and tighten with socket wrench—that's all there is to changing a Budd-Michelin!



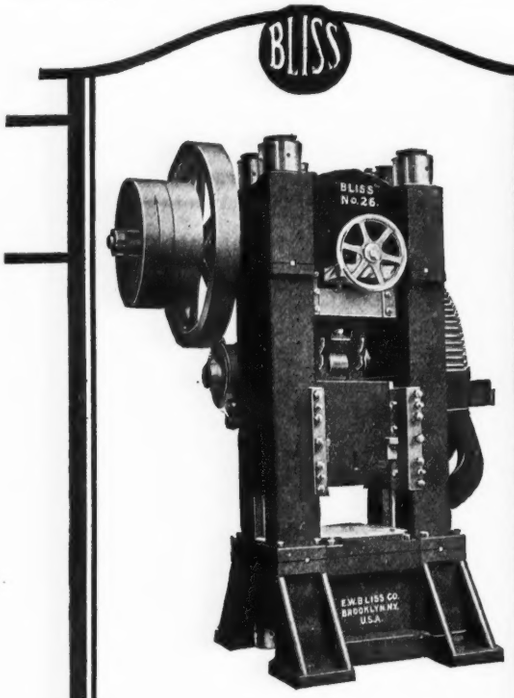
Chamfers **2** Bushings at cost of **ONE** BOTH ENDS at once

There is REAL cost-cutting where the Grant Double-End Chamfering Machine is used. Where other machines chamfer, burr, or face bushings in TWO operations, Grant does BOTH ENDS in ONE — and at HALF the cost. Machine also countersinks and counterbores rods, bushings, pipe, piston pins and similar parts up to 2½" diameter, AUTOMATICALLY. Operator simply feeds magazine. The Grant Double-End Chamfering Machine will handle 2400 15/16" bushings, etc., per hour.

Let us give YOU a production estimate from your samples or blueprints.

The Grant Mfg. & Machine Co.
Bridgeport, Conn.

GRANT DOUBLE-END Chamfering Machine



BLISS

Knuckle Joint Embossing Press

This type of press, one of the big Bliss line, is specially adapted to embossing silver, brittania, brass, copper, etc., in the manufacture of medals, coins, regalia, jewelry, watches, silverware, etc. It has enabled many manufacturers of articles of this nature to reduce their production costs, improve the quality and appearance of their product, and widen their market.

No matter what your sheet metal operations may be, there is a Bliss type that can assure utmost economy of manufacture. Let Bliss offer recommendations.

BLISS for MACHINERY

E. W. BLISS CO. MAIN OFFICE AND WORKS **BROOKLYN, N. Y., U. S. A.**

Sales Offices DETROIT General Motors Bldg. · CLEVELAND Guarantee Title Bldg. · CHICAGO London Guar. & Accident Bldg. · PITTSBURGH Oliver Bldg. · CINCINNATI Union Trust Bldg. · NEW HAVEN 2d National Bank Bldg. · ROCHESTER Times Union Bldg. · PHILADELPHIA Pennsylvania Bldg.

American Factories: BROOKLYN, N. Y. HASTINGS, MICH. SALEM, OHIO CLEVELAND, OHIO

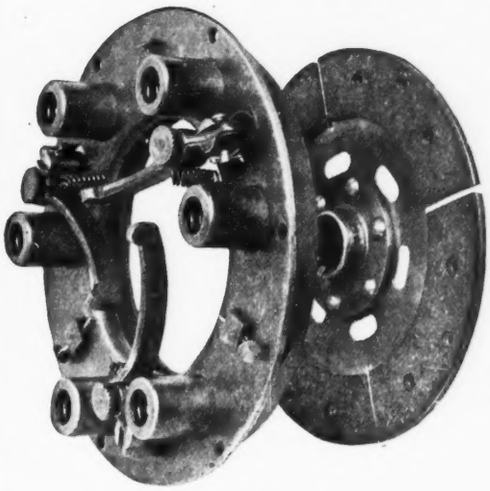
Foreign Sales Offices and Factories:

ENGLAND: Pocock St., Blackfriars Rd., S. E., London. Norwich Union Chambers, Birmingham. FRANCE: 54 Blvd. Victor-Hugo, St. Ouen, Sur Seine, Paris.

No. 442

The ROCKFORD CLUTCH

Improves Passenger Cars



Model 9-HH for Passenger Cars

in addition to its sales advantages is superior from a production standpoint—economical, efficient, durable.

A Tremendous Selling Asset

Prospective buyers of automobiles always want to drive the car they plan to purchase. Easy shifting gears make them decide. The Rockford Clutch has a smooth and positive action and now is standard on ten cars, trucks and buses.

Furnished as a Complete Unit

The Rockford Clutch is adjusted before shipment and can be installed at once. It needs no further attention. The cost will appeal to your purchasing department. The superior advantages will impress your engineers and complete unit installation will interest your production heads.

Plays a Part in the Sale of New Cars

A prospective purchaser of an automobile with a Rockford equipped clutch is pleased with practically his first contact with the car. Obvious superior features are ease in shifting, quietness of action and elimination of vibration.

Write or wire. Our engineers will call at once.

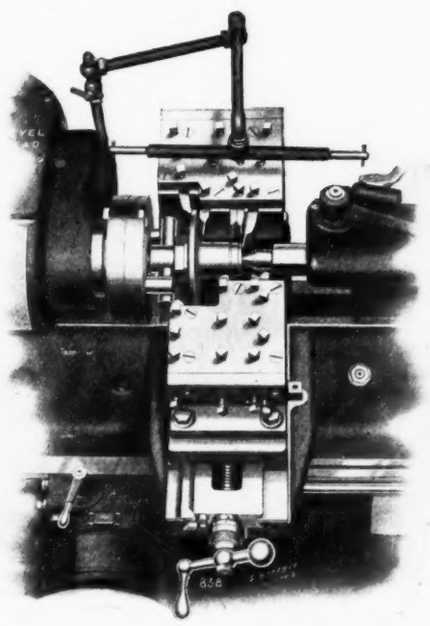
ROCKFORD CLUTCH

ROCKFORD DRILLING MACHINE CO.
ROCKFORD ILLINOIS

THE MULTI-CUT LATHE

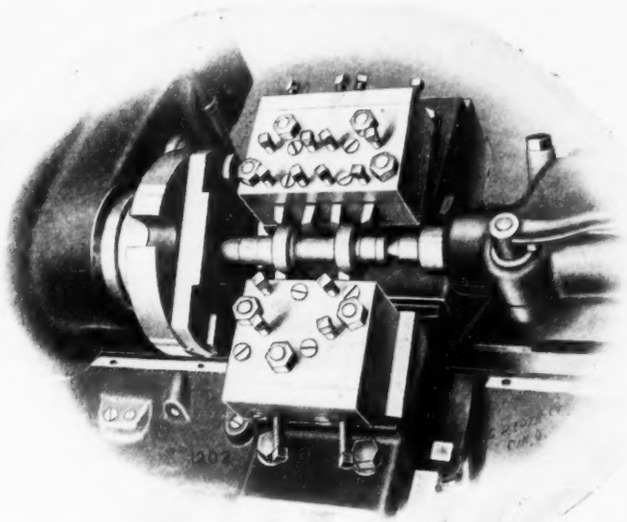
For Quantity Production of Automotive Parts

A semi-automatic lathe for machining wheel hubs, pistons, transmission gears, steering knuckles and other similar parts, in record time.



Machining Wheel Hub—No. 9 Multi-Cut Lathe—Production 50 Parts per Hour

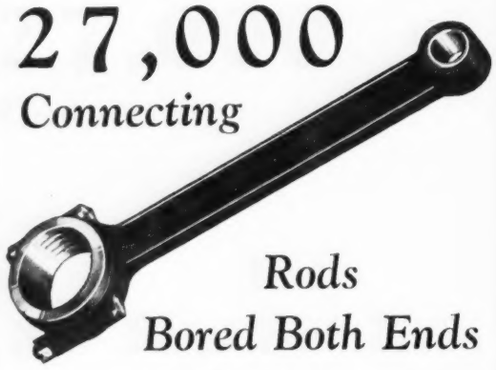
Built three sizes 6", 9" and 12" swings, all with geared headstock. Our Service Department will gladly submit tooling recommendations and estimated production upon receipt of your blueprints.



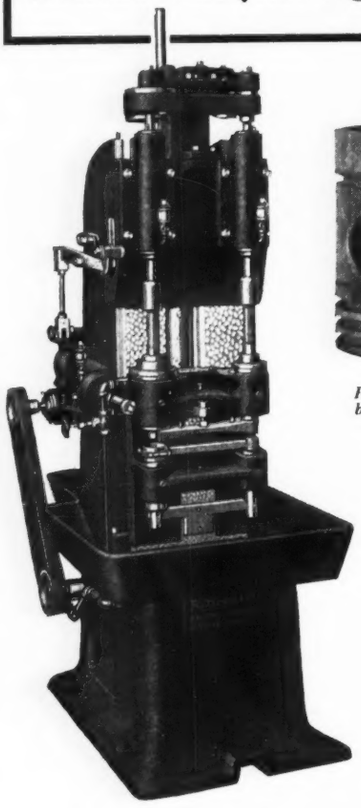
Machining Transmission Pinions—No. 9 Multi-Cut Lathe—Production 120 Parts per Hour

The R. K. LeBlond Machine Tool Co.
CINCINNATI, OHIO

27,000
Connecting



Rods
Bored Both Ends
without adjusting cutters

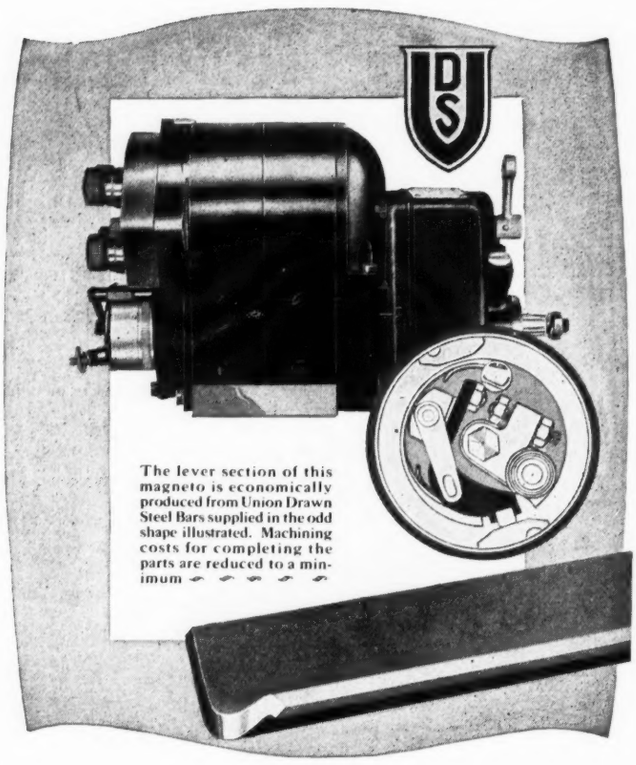


Piston-pin holes can be bored at a new high rate

This is the performance reported by a user of the "Coulter" Diamond-Tool Boring Machine. In three weeks this machine bored both ends of 27,000 connecting rods without so much attention as adjusting the cutters.

If *you* are not satisfied with the results you are getting by reaming and broaching, get in touch with us. We have something for you. The Automatic Machine Co., Specialists for 29 years on automatic production machinery, 115 E. Washington Ave., Bridgeport, Conn.

Coulter
Automatics
PAT. APPLIED FOR
DIAMOND-TOOL BORING MACHINE



The lever section of this magneto is economically produced from Union Drawn Steel Bars supplied in the odd shape illustrated. Machining costs for completing the parts are reduced to a minimum

In the production of many finished parts, these special shapes supply the elements of strength, high wearing resistance, clean surface, *and above all*—economy

UNION DRAWN STEEL CO.
Beaver Falls, Pennsylvania

UNION DRAWN
STEELS

$33\frac{1}{3}+33\frac{1}{3}+33\frac{1}{3}=100\%$

Three essential qualities combine to make advertising mailing lists of real value.

1. Completeness

It must include the names of all those whom the advertiser would reach with his merchandise message.

Chilton Class Journal lists cover every phase of automotive merchandising interest —manufacturers—wholesalers—jobbers—distributors—dealers—garages—repair establishments — service stations — accessory stores and departments.

2. Correctness

"Dead" names promptly eliminated. Change in addresses quickly made—all concerns and individuals listed under their proper classifications.

Chilton Class Journal lists are authenticated by daily corrections. During 1926 there were in excess of 100,000 changes on our 102,000 dealer list. This is possible with a big organization, trained as specialists and having incomparable facilities.

3. Selectivity

Stencils must be kept in such form as to speedily divide into any group, or combination of groups, that may be desired.

We can make almost any selection that the diversified requirements of the individual advertiser may demand—either by state or county, by cities and towns of varying sizes, by combination of the various automotive industrial or trade divisions, etc., etc.

[The listing service is but one part of our Direct Mail Division. It includes, in addition, plans, copy, art work, cuts, printing, multigraphing, etc. "Everything from the idea to the post office."]

If you have need for Direct Mail, in conjunction with your publication advertising, we will be glad to cooperate whole-heartedly.
Please address:

Direct Mail Division

Chilton Class Journal Co.

PHILADELPHIA

Shuler
Front Axles

FOR TRUCKS, MOTOR BUSSES, TAXIS

AND A COMPLETE LINE FOR

TRACTORS AND TRAILERS

STANDARDS

Standards of perfection have been established for labor.

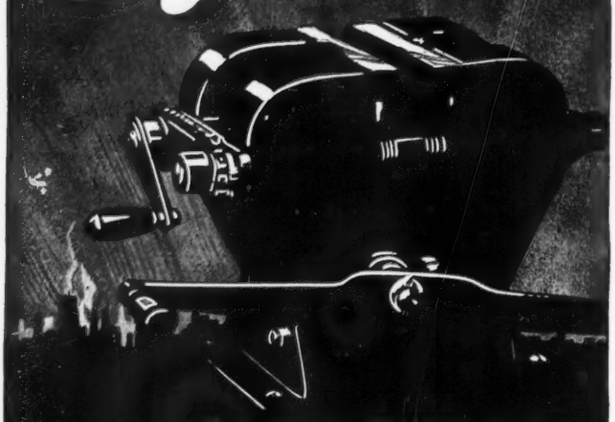
We are continually striving for a standard of perfection in material and workmanship.

SHULER AXLE CO.
INCORPORATED

LOUISVILLE, KY.

Member of Motor Truck Industries, Inc., of America

Speed!



Three Dominant Features (SPEED—POWER — EASE OF OPERATION) place the New Clipper No. 8 SPEED Lacer in a class by itself.

SPEED: This new machine laces both ends of any belt up to 8 inches in width in 1½ minutes.

POWER: 45,900 pounds pressure, the weight of 300 men, is developed by a new principle.

EASE OF OPERATION: One man operates it easily.

Weight 100 pounds. Price on application.

Every lacing requirement is anticipated by the Clipper Belt Lacer Company. The use of Clipper Products is an assurance of increased production, efficiency, and economy in plant operation.

QUALITY BELT LACING

Clipper Belt Lacer Company

GRAND RAPIDS
MICHIGAN

Clipper

No 8 Speed Lacer

COWLES CLEANERS for

successful
chromium plating
on steel or brass

THE COWLES DETERGENT CO.

560 Commonwealth Building
Euclid Ave. and East 102nd St.
CLEVELAND, OHIO

Over 90% Coverage

Manufacturers of semi-fabricated and fabricated parts, machine tools, supplies and materials can reach over 90% of their quantity buyers in the automotive field by advertising in Automotive Industries.

There is no other medium of equal coverage or equal prestige in the industry.

This fact is recognized by leading advertisers. Read their names in the index on the next to the final page.

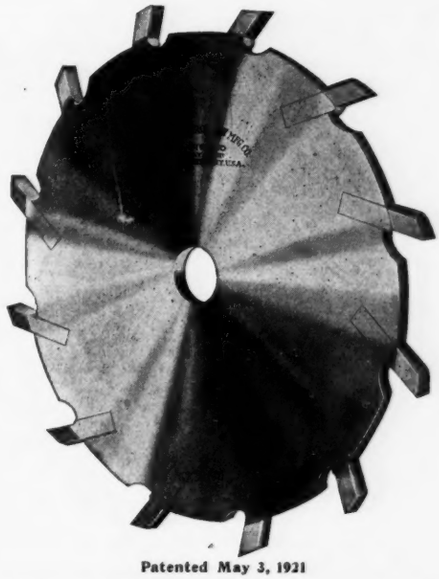
Automotive Industries

"QUALITY - -
above every other requirement"

By giving every consideration to the steel from which Mansfield Lock Washers are made and to the processes and methods used in their making we produce a complete line of lock washers in exact accord with the most rigid inspection under the S.A.E. standard. Our new catalog gives details—write.

MANSFIELD LOCK WASHER CO.
Mansfield, Ohio

MANSFIELD
Lock Washers



Patented May 3, 1921

This groover will cut 10 to 20 times as long as the ordinary groover without sharpening. The high speed steel teeth or inserts may be replaced when worn. Sharpening is done on top of tooth only.

Write for Catalog

HUTHER BROS. SAW MANUFACTURING CO., Inc.
Rochester New York

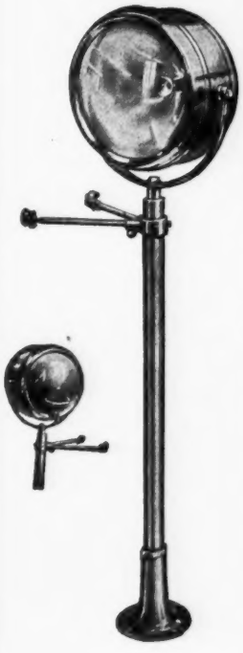
DETROIT TIRE CARRIER

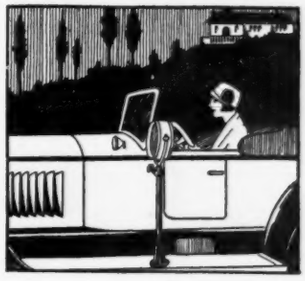
NO STRAPS OR CHAINS TO CHAFE THE TIRES

STANDARD EQUIPMENT ON MAJORITY OF AMERICA'S BETTER CARS

DETROIT CARRIER & MFG. CO.

DETROIT, U.S.A.





A running-board searchlight—designed to accentuate the long, sweeping lines of the modern sport job. Why not offer them as optional equipment on your sport models?

The Aga is built in two sizes—nickel or brass finish — solid brass throughout.

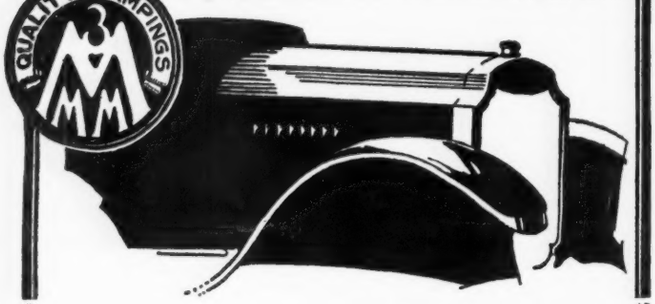
Type E-RBS-21, lamp diameter 8"
Type G-RBS-55, lamp diameter 11¼"
Adjustable height from 36" to 40"

Headquarters for automobile lamps of all kinds.

AGA

AGA AUTO LAMP CO., Inc., *Amesbury, Mass.*

QUALITY STAMPINGS



DISTINCTIVE FRONT ENDS ARE THE RESULT OF GOOD DESIGNING AND MOTORS METAL PRODUCTION SKILL

FENDERS
DUST SHIELDS
GASOLINE TANKS
RUNNING BOARD SHIELDS
RUNNING BOARDS
HOODS
RADIATOR SHELLS
BODY STAMPING

MOTORS METAL MFG. CO.
5936 Milford Ave. Detroit, Mich.

Typical SS Forging

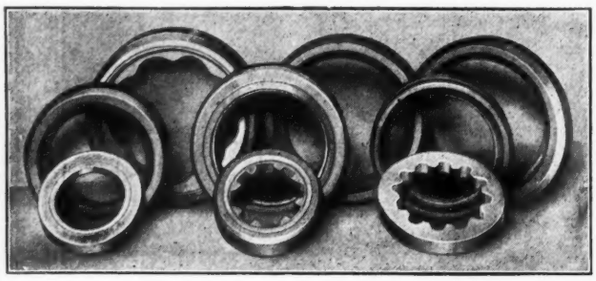
Steering Knuckle, 40 lbs.

Perfect Drop Forging Service

THE right forging at the right time. Our capacity for 2,000 tons per month of forgings up to 300 lbs. in weight is made possible through our modern production facilities. Complete laboratory and heat treating equipment. Our engineers will gladly co-operate with yours in making estimates and suggestions—there is no charge.

We Solicit Your Inquiries

UNION SWITCH & SIGNAL CO.
Drop Forge Division
Pittsburgh District Swissvale, Pa.



PHOSPHOR-BRONZE Worm gear castings will only last longest with the correct

Crystal Structure Control

during the casting of the gears. *Twenty-six years* of research in our laboratory enables us to produce the best at the lowest price.

LUMEN BEARING CO.
197 Lathrop St. Buffalo, N. Y.

Buffalo Bolt Co.
North Tonawanda, N. Y.

Carriage, Machine, Hub, Rim and Innumerable Special } Bolts

SEMI-FINISHED NUTS
USS and SAE
of Exceptionally High Quality

SALES OFFICES: Chicago, Detroit and Kansas City

COOK SPRINGS FOR MECHANICAL PURPOSES

COIL AND FLAT SPRING OF EVERY DESCRIPTION

ANN ARBOR, MICH. CO.

Add a Lasting Thrill to any Motor

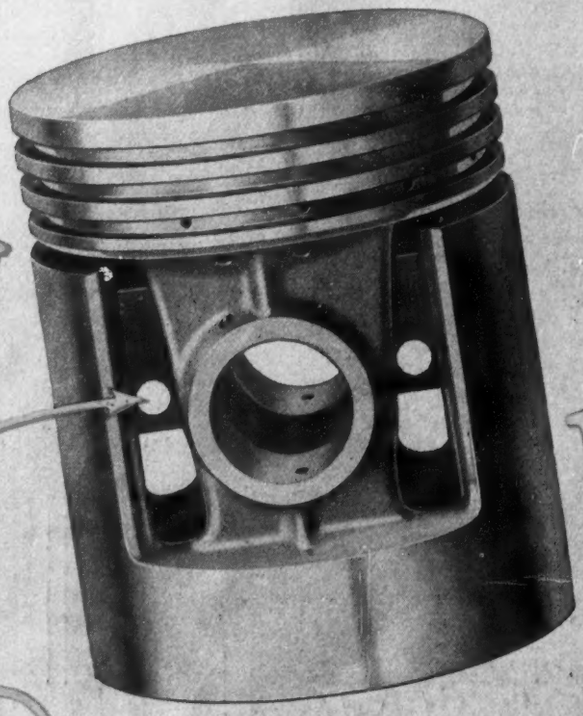
Stay Put!

BOHNALITE

Bohn Products include Ring True Bearings—Bohnalite Castings, semi-permanent, permanent mold and sand, Nelson Bohnalite pistons; we also supply the government with replacement pistons and bearings for the Liberty engine.

THE LIGHT ALLOY PISTON WITH A STEEL BACKBONE

Stay Put!



The Backbone of Steel or Strut

Special alloy steel struts are cast in, to control expansion and maintain satisfactory clearances under all engine operating conditions. The struts are the backbone of piston endurance and long life.

Often times, especially in the case of light alloy pistons, the fitting at the factory means but little, because of distortion of the metal in pistons when they are subjected to the heat of combustion.

Heat-treated Nelson ★Bohnalite Pistons are not affected by the heat of combustion and their backbone of steel makes them stay put.

★BOHNALITE, the alloy from which this piston is made, should never be confused with any other light alloy upon the market. Every Nelson Bohnalite Piston is heat-treated for uniformity, strength and hardness.

Nelson Bohnalite Pistons are already being used by manufacturers of cars, for which they claim unprecedented performance—a list of them will be gladly furnished upon request along with a booklet which further describes the design of this outstanding piston.

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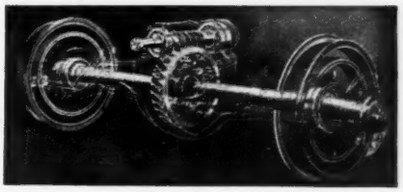

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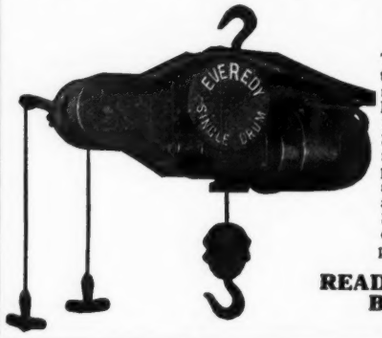

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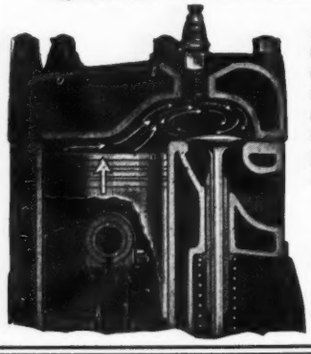

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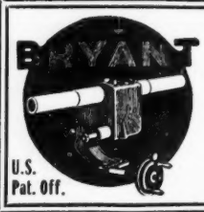

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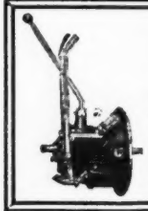

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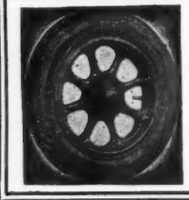

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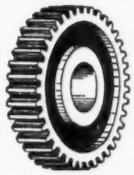

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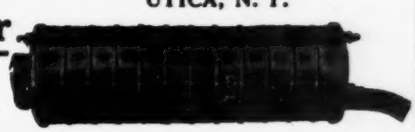

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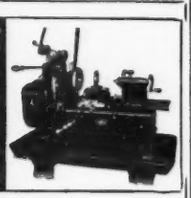

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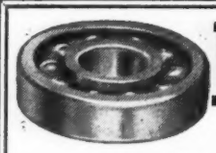

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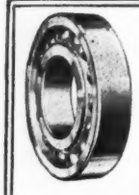

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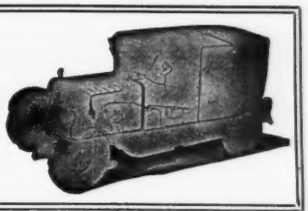

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See Alphabetical List of Advertisers on Second and Third Following Pages

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Bearings Co. of America
General Bearing Co., Inc.
Gurney Ball Bearing Co.
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Bohn Aluminum & Brass Corp.
Lumen Bearing Co.
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Phosphor Bronze Smelting Co.
Stewart Die Casting Co.
U. S. Graphite Co.
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General Bearing Co., Inc.
Hyatt Roller Bearing Co.
Timken Roller Bearing Co.

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Clipper Belt Lacer Co.

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Witherow Steel Co.

Blanks, Gear & Pinion
Lumen Bearing Co.

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Link-Belt Co.
Union Switch & Signal Co.

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Budd Mfg. Co., E. G.

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Russell, Burdsall & Ward Bolt & Nut Co.

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Bullard Mach. Tool Co.

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Driver-Harris Co.

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Smith Corp., A. O.

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Konigslow Mfg. Co., Otto

Brake Drums
Bossert Corp.
Carnegie Steel Co.

Brakes, Air
Christensen Air Brake Co.

Broaches
Lapointe Co., J. N.

Broach Grinding Machines
Lapointe Co., J. N.

Buffing & Polishing Machines
Black & Decker Mfg. Co.
Warner & Swasey Co.

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Bossert Corp.
Eaton Axle & Spring Co.

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American Non-Gran Bronze Corp.
Burgess-Norton Co.
Danly Machine Specialties, Inc.
Phosphor Bronze Smelting Co.
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Powell Muffler Co.

Camshafts
Gordon Mfg. Co., L. O.
Union Switch & Signal Co.

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Carter Carburetor Co.
Tillotson Mfg. Co.
Wheeler-Schebler Carburetor Co.

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Hirst-Roger Co.

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Detroit Carrier & Mfg. Co.

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Doehler Die Casting Co.
Stewart Die Casting Co.
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Doehler Die Casting Co.
Lumen Bearing Co.
Phosphor Bronze Smelting Co.
Stewart Die Casting Co.
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Alemite Die Casting & Mfg. Co.
Doehler Die Casting Co.
McGill Metal Co.
Milwaukee Die Casting Co.
Stewart Die Casting Co.
Iron
Driver-Harris Co.
Malleable
Eberhard Mfg. Co.
Erie Malleable Iron Co.
Link-Belt Co.
Steel
Link-Belt Co.

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Link-Belt Co.
Morse Chain Co.

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Grant Mfg. & Mach. Co.

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American Felt Co.
Western Felt Works

Chemicals, Rust Removing and Preventing
American Chemical Paint Co.

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Bullard Mach. Tool Co.
National Acme Co.
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Heald Machine Co.

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Danly Machine Specialties, Inc.

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Kinite Corp.
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Borg & Beck Co.
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Rockford Drilling Machine Co.
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Rockford Drilling Machine Co.
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Wisconsin Motor Mfg. Co.

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No. 33

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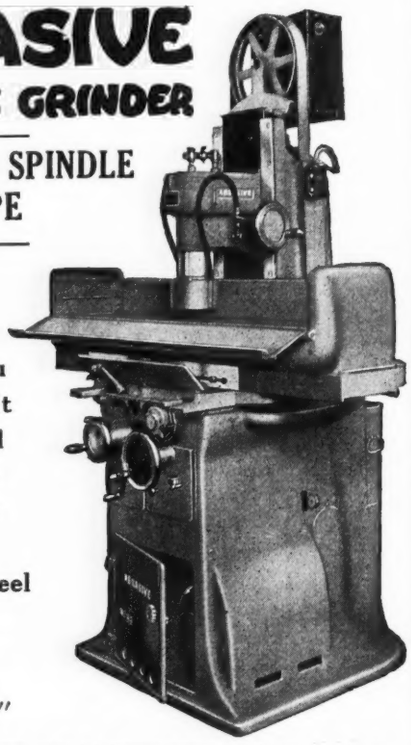
SURFACE GRINDER

VERTICAL SPINDLE TYPE



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The handwriting on the wall . . .

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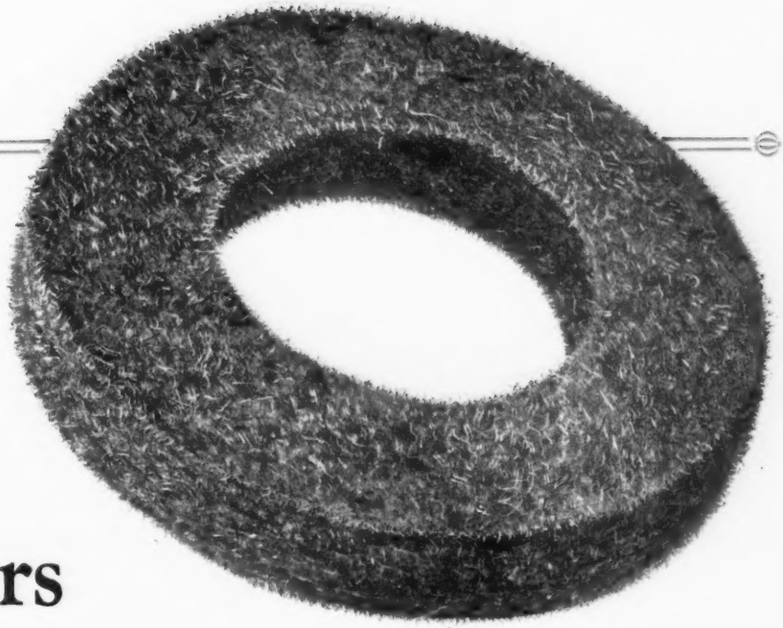

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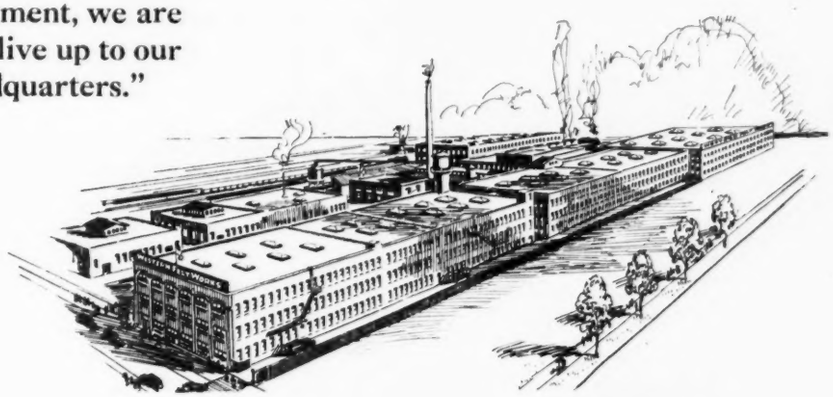

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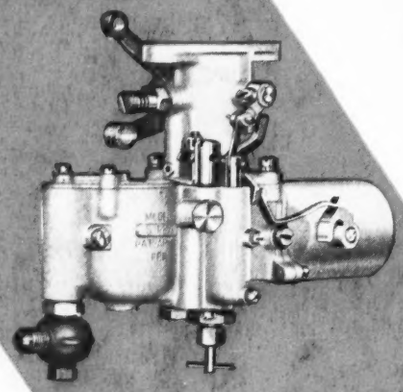

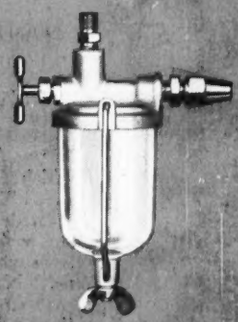

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